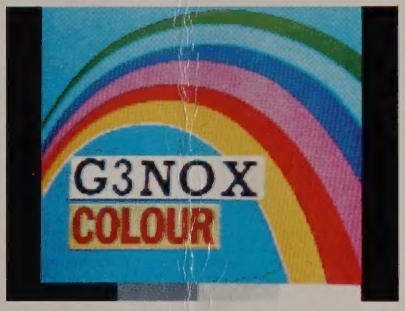
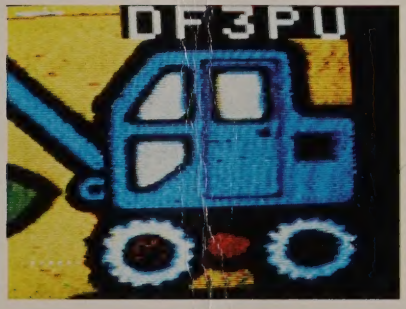
"FOR THE SPECIALIZED COMMUNICATION RADIO AMATEUR"

AMATEUR TELEVISION MAGAZINE ™

NOVEMBER 1982 VOLUME 12 NO. 11 PUBLISHED MONTHLY "OUR 16TH YEAR" $2.00

COLOR SSTV SPECIAL ISSUE!





COLOR SSTV "ITALIAN STYLE" VIA PIERO MESCALCHIN 13XQW, PADOVA, ITALY

PHOTOS RECEIVED ON VOLKER WRAASE SC-422A COLOR SSTV SCAN CONVERTER

THANKS TO JEREMY ROYLE G3NOX, ENGLAND FOR MAKING THE COLOR SEPARATIONS USED ON THE FRONT COVER OF THIS SPECIAL ISSUE

ICOM IC-490A

Space Age Communications

The IC-490A transceiver provides many desirable base station features in a mobile package. This compact, high performance multimode radio features FM, SSB and CW (CW monitor included) to satisfy your needs in the 430-440 MHz region.

The IC-490A provides rapid QSY and accurate frequency selection in the 430 MHz band with tuning rates of 25, 5 and 1 KHz in FM; 5, 1 and 0.1 KHz in the other modes. Duplex offsets are adjustable in 100 KHz increments.

Two VFO's, priority call frequency, 1 MHz up button and 4 memories mean convenience in quickly selecting important frequencies.

Scanning features include full band scan, programmable band scan (scans between memory 1 and 2) or memory scan.

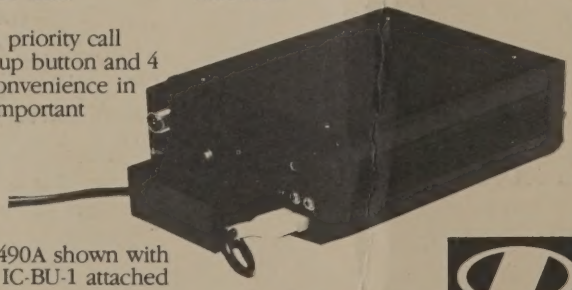
Using internal switches, the IC-490A will resume scan after an adjustable time delay, resume scan after carrier drop, sense busy or empty channels, and control scan speed.

Use the call button to automatically select a frequency designated as the primary channel overriding other transceiver functions.

The IC-490A has a highly visible green LED readout for use over a wide range of ambient light conditions. Also, there are LED annunciators for receive, send, priority, call and duplex, as well as an LED meter. For receive on SSB, AGC speed and noise blanker are controlled from the front panel. Memory backup is available with the optional IC-BU-1 memory backup unit.

With 10 watts output in a 6 11/16″ wide x 2 1/2″ high x 8 5/8″ deep package, the very compact IC-490A gives you multi-featured operation for your entry into the 70 cm band.

Included with the IC-490A is the new IC-HM7 microphone for remote up/down frequency control. See the new IC-490A at your dealer today.



IC-490A shown with IC-BU-1 attached

ICOM

The World System

2112-116th Avenue NE, Bellevue, Washington 98004 / 3331 Towerwood Drive, Suite 307, Dallas, Texas 75234

All stated specifications are approximate and subject to change without notice or obligation. All ICOM radios significantly exceed FCC regulations limiting spurious emissions.

"OFF THE REEL"
A5 Editorial Comments

PEORIA A5 MEETING "IN RED"

The fall September "Midwest" UHF-ATV Conference held this year in Peoria, Illinois went over very well as far as "quality" but was a bit disappointing as far as numbers of attendees. A5 Magazine (sponsor) took a "bath" financially on the entire affair but we hope the quality speakers, displays and events will filter back home to those who did not attend and 1983 will be a break-even situation. The Peoria area Amateur community has not responded well to specialized ATV forums and meetings and after 3 years of trying, we have decided not to continue wasting our time in that regards. Peoria will indeed be the location for next year's get-together with Milwaukee discussed for 1984. I always try to remember WB9MCF's stories of how it took over a year to see responses from downstate Illinois "seed planting". Ron, a farmer, knows it sometimes takes awhile for the "harvest" to reap a ripe crop! We have been trying to provide a little "rain" in the Peoria area, but so far only two plants grew..... Just a quick note about a touchy situation with JASCO and SPECTRUM INTERNATIONAL. John Beanland G3BVU/1 has been supportting A5 Magazine and ATV'ers in general for many years now. His gentlemenly manner, responsible followup and honest policies have earned him the respect of many of us. I have yet to hear any bad stories about John or his fine business. If somebody has a "filtering" problem, John sends out the remedy UPS. If that does not cure the problem, John cheerfully refunds monies paid and continues to try to aid the ATV'er with further help. John's devotedness to the ATV modes in particular, was apparent at this years Midwest Conference. We do not like some of the "tactics" being perprotrated on the Amateur Community by JASCO Corp. and thusly are continuing to support Spectrum International of Concord, Massachusettes as our recommended source for Microwave Module and Jaybeam products. John shows his support of us in taking out a years contract for the "inside front cover" of A5 Magazine starting with the December issue. There is a "great" buy on a Pentex brand Color Camera (Hitachi GP-41D) in a new advertiser this issue. This is a local Camera/Video Store near us and we constantly see tremendous bargains there all the time -so we talked the owner to try running some mail-order ads. I can attest for the reputation of this firm and A5 backs up any problems that might develop with material purchased. Drop us a line and let us know what you bought and how it works. Our "special thanks" to Jeremy Royale G3NOX and I3XQW for their help in bringing about the regular November Special SSTV Issue! Get those ATV antennas all buttoned up for winter!

Volume #12 Issue #11 "Special SSTV Color Edition"

. A5 On Mt. Everest!
. New "Captain Video Speaks" Column!
. Low-Cost Pentax Color Camera Available!
. ATV Video Distribution Amplifier-WAØIWF
. 3rd Annual "Midwest UHF-ATV" Conference Report!
. Regency HR-440 FM Rig Modifications for ATV-WB4YTU
. Scan With A Difference (CQ Reprint)-KB9FO
. SSTV'er of the Year Award 1982! (KB9MC)
. 8-12-16-25 Second Single-Frame Color SSTV-WØLMD!
. SSTV Basics-WB9LVI
. New Microcraft "Videoscan 1000" SSTV Converter!
. Color SSTV and the Apple Computer-WA6NFA/W6LLO
. TRS80C Major Breakthru!-K6AEP
. "Sharp" RGB Loading Technique for B/W Cameras-W8ASF
. Australian "Down Under" Color/BW SSTV Converters!
. 525 line, 1/32nd of a second frame Color TV for SSTV'ers!
. A5 Classified Ads!

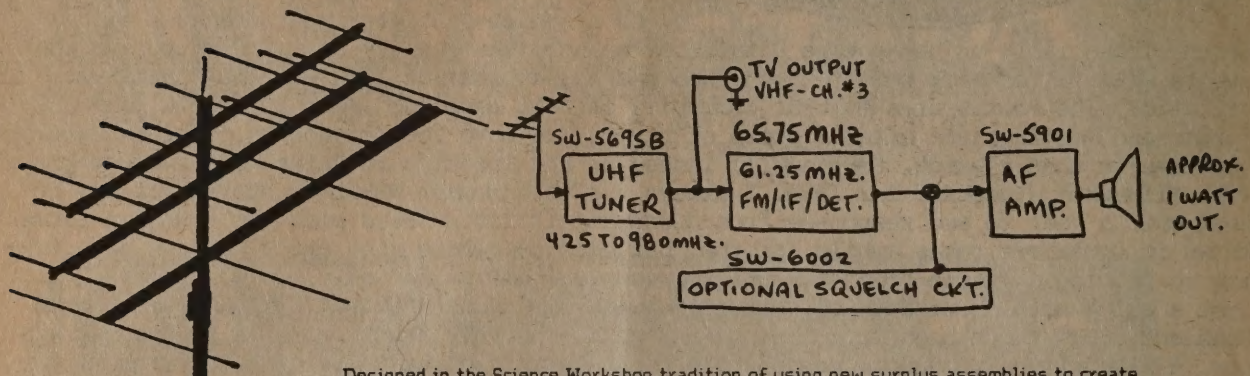
Send in your Operation A5 Santa Claus Reports for December 1982!!!!!

P.S. Our December "Christmas" Issue lineup features; How to use Oscilloscopes for ATV, A new A5 Video P-Chart Illustration from WBØZJP, Canadian ATV Report, More ATV-DX Tips, 1200 Mhz. ATV Downconverter Project, 1240-1290 Mhz. Parabolic Antenna-N6WQ and more!

NEW

SCIENCE WORKSHOP

ATV ON-CARRIER OR SUB-CARRIER SOUND RECEIVER



Designed in the Science Workshop tradition of using new surplus assemblies to create unique products, this new project uses two pre-wired and tested assemblies to make a really super ATV sound receiver. The SW-5802 is a complete FM sound receiver module modified to tune to the on-carrier sound signal after it has been down converted to TV channel 3 by your ATV converter. (Other TV channel frequencies available). The SW-5901 is a high gain audio amplifier assembly with all of the power supply components except the 12 volt filament transformer or speaker. Adding these 2 parts and then connecting the finished receiver to the VHF antenna terminals of the TV set (in parallel with the output of your ATV converter) is all that is necessary to produce the best on-carrier ATV sound you've ever heard. No tuning or alignment is needed. Remember, these modules are not kits. They come factory wired, tested and aligned - ready to go to work. Receiver uses AFC to eliminate drift problems. An optional squelch circuit kit is available (and highly recommended) to eliminate background noise when the carrier drops The FM receiver module is also available tuned to the sub-carrier frequency for a "super" performance sub-carrier sound receiver. No intercarrier sound buzz, since this method uses a seperate sound "IF" channel, rather than the intercarrier sound detection system in the TV set. Specify "On-carrier" or "sub-carrier" sound when ordering. See Editor's Review in Sept. issue of A5 (Amateur TV) Magazine.

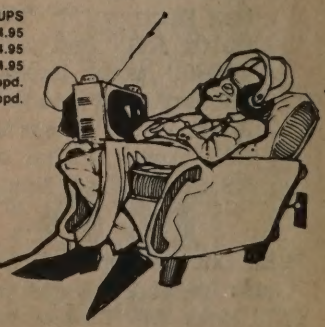
ATV SOUND RECEIVER ASSEMBLIES		Quant.	Total
BASIC RECEIVER PACKAGE (choose on-carrier or sub-carrier) ☐ SW-5802A 65.75mhz on-carrier FM tuner or ☐ SW-5802B 61.25mhz sub-carrier FM tuner and SW- 5901 AF Amplifier/supply	34.95		
SW-6002 Squelch C'kt. KIT $14.95			
UPS Shipping $1.50			1.50
N.Y.S. Residents Sales Tax (7%)			
Total Am't. Enclosed			

Other Great Science Workshop Products;

- 91 Channel Quartz TV Tuner! ..... $29.95 plus $3.00 UPS
- Poor Mans Spectrum Analyzer ..... From $34.95
- UHF Varactor Tuners (Channel 3 output) $34.95
- Sanyo Color TV Board and Parts $34.95
- Coding and Decoding TV Signals Book ..... $9.95 plus $1.50 ppd.
- A5's New ATV Book "Everything You Always Wanted To Know About ATV" ..... $9.95 plus $2.50 ppd.
- We Stock "SILVERNAIL" ATV Products!

"WRITE FOR "FREE" LITERATURE TODAY!"
"OUR 16TH YEAR!"

RUSH YOUR ORDER TO:
SCIENCE WORKSHOP
Box 393, Bethpage, N. Y. 11714



"Letters To The Editor"

P.O. Box H, Lowden, Iowa 52255

"My congratulations on your first year with the new format! My special interest is in SSTV. I am using the Wraase SC-77 main board plus two W9NTP extra memories for Color SSTV including video processors, dithering, cursors, switching circuirts and the G3OQD video light-pen. I am anxious to see the Don Miller articles & any articles on single frame color pictures. I will be looking for all of you on the air!"- Enric Bonada Dou EA3AYA, Ripoll, Spain

"Wow, did you tell it like it is Mike! Your October issues "comments" about SSTV not being fun anymore bared some facts we all suspected. Maybe now those individuals that have ruined SSTV will take second thoughts on making more $$$ on the next series of modifications? Long live 8 second black/white and experimentation with higher resolution pictures!" -Donald Lamport, Tucker, Georgia

"I recently got started in ATV by building an eight element quaqi and buying the PC Electronics downconverter. With alot of help from the locals, I am now receiving P5 video. I have so many questions though, I have decided to purchase the ATV Manual- Everything You Always Wanted To Know About ATV* but were afraid to ask for $12.45. Thanks much!" -Rick Rydeen WBØOEH, St. Paul, Minnesota

"Due to an extended illness, I have not been very active on ATV. With over 600 Hams in the area, try as I may-I just can't seem to get many interested. One is finally getting on FSTV with me and perhaps that will open the door? With 200 members in the GCAR Club, we can demonstrate live TV to them and hope for results. My antenna was grounded out due to damage by removal of a tree, I have hardline installed and the antenna is now rebuilt by a friend. (I recommend doing it yourself). I have been in the hospital 16 times in 5 years, once with my pacemaker failing, surgery for 3 major heart attacks and still ready for serious ATV work! Looking for contacts in the Flint Michigan area DE KB8NR" -Floyd (Let's see some activity!) A5-Keep up the spirit Floyd!

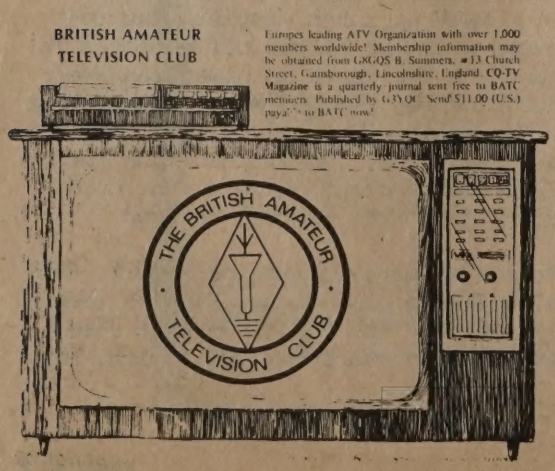
"I just finished working WB9LVI and his new model high-resolution SSTV scan converter and the picture he sent me of his daughter was absolutely fantastic! (I can receive 16 actual shades of grey). He suggested that you might be interested in my current total scoring of first time (two-way) SSTV contacts. My total is now 1,792! I started to fill out the forms for the A5 Magazine 1500 plus certificate, but it seems that postage is just too expensive to send all of the log material (Editor-it's on it's way Richard!). I am finding my DL2RZ Volker Wraase SC-422A 3-memory Colour SSTV Scan Converter is most effective for 3-colour SSTV pictures despite what the "reviewer" in WORLDRADIO thinks! Surely, his column would be better off employed in trying to secure an official 20 meter SSTV frequency where there is always an everlasting fight for a clear frequency to send video pictures (14.230 Mhz.) rather than stirring up trouble between groups of SSTV'ers. The Wraase CM-60 circuit is most useful for feeding the 3-memory colour memories into the TV set (RF) rather than thru the "guns" where control of contrast is lost. 73's from England, keep up the good work on A5 and see you all on SSTV, DE G3WW" -Richard Thurlow, Cambs, England

"Gee, KB8LU of WORLDRADIO doesn't like Volker Wraase's gear, Don Miller's work, Clay Abrams software, A5 Magazine, WØLMD's criticism, WA7WOD's promotions, K4TWJ's ideas, the Dayton and other hamfest forums, high-resolution SSTV and God knows what else? What does he like or what has "he" done for Amateur Radio and SSTV?" -C. Smith, NY.

VIDEO FLASH!

NEW A5 VIDEOTAPE LIBRARY SERVICE COMING

At last, an Amateur Radio video cassette library service for A5 Magazine subscribers! We are ed iting and compiling a number of interesting programs including events at Dayton, Midwest ATV Conferences, ATV Filters, Public Service ATV, Getting Others on ATV, Best USA FSTV Signals, A5 Test Patterns, NTSC Color Bars, Color and Motion SSTV and lots More! Show or copy these tapes for your own use to get ATV activity going! Details in Dec A5.


BRITISH AMATEUR
TELEVISION CLUB
Europes leading ATV Organization with over 1,000 members worldwide! Membership information may be obtained from G8GQS B. Summers, 13 Church Street, Gainsborough, Lincolnshire, England. CQ-TV Magazine is a quarterly journal sent free to BATC members. Published by G3YQI. Send $11.00 (U.S.) payable to BATC now!
THE BRITISH AMATEUR TELEVISION CLUB

Channel 4

HAM TV GOES TO MT. EVEREST

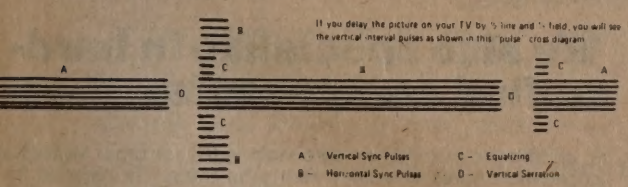
Around the first of August, I got a phone call late one evening from a Canadian Ham looking for information on transmitting a live television FSTV signal from a very high elevation down to a "base camp" miles below under adverse weather conditions. I began to put together the bits and pieces to realize these guys weren't fooling at all and meant serious business. I gave a few basic setup requirements to the caller and also the number of Tom O'hara W6ORG of PC Electronics in Arcadia, California as a "maker" of specialty FSTV equipment. The evening national news (ABC Nightline with Ted Koeppel) was on my TV set on October 1st and there they were...Mt. Everest Expedition team members climbing the worlds highest mountain. Two "base camps" had already been established at various levels up the mountainside with only a mere 8,000 feet to go! Then came the flash of a Yaesu HF Transceiver and communications via Ham Radio back to the ground station and media control center near Nepal. And what was the news announcer talking about? Why the "teams" live Television transmissions that were scheduled around the 20th of October at the "peak" (weather permitting) on ATV back down to the base camps set up with monitoring equipment of course! I got on the phone immediately to Tom O'hara W6ORG and as usual Mary Ann must have been keeping him occupied again as it just rang & rang with no answer. Well, Tom must be on my wavelength, because a few days later I received a short note from him that he indeed had made a special 434 Mhz. ATV transmitter for the Canadian Mt. Everest Expedition 2 weeks ago to be used with a Hitachi VKC1000 MOS camera for a live "VE3MDX" ATV signal to be beamed about 17 miles into the Nepal valley area. KLM supplied a 6 element antenna at the request of W6ORG. Tom boasts now that PC ATV Equipment is on the air from the 26,000 foot level-the highest spot in the world! Watch our December issue, hopefully we will have more details and maybe even some great pictures? -WBØQCD

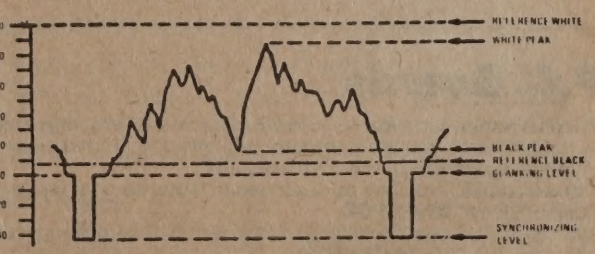
A5 ATV MAGAZINE NOW ON SALE AT:

AMATEUR ELECTRONIC SUPPLY
4828 West Fond du Lac Avenue
Milwaukee, Wisconsin 53216

NEW A5 VIDEO TECHNICAL COLUMN

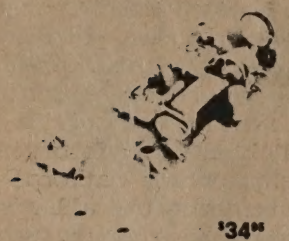
"Hi gang!" This is Captain Video speaking to all my loyal ATV enthusiasts out there in A5 land. I have been bugging Mike to devote some regular space each issue to some technical discussion on TV Video. My identity is known only to the publisher. I will be covering in these next months, everything from how TV works to Antenna systems. If you have any questions out there, send them in to A5 clearly marked "Attention Captain Video". Now, let's talk about the video signal a bit; All TV signals have two things in common; the video information elements which is the representation electronically of the viewed picture display and sync pulses (sometimes called synchronizing signals) which recreate the picture to a stable and organized fashion on the screen. It is the "sync" that controls the sweep circuits in the TV receiver so that all those neat little pixels are placed in a correct manner on the TV set. Two directions are needed in both cameras and TV signals for this electron beam to be scanned and controlled; right, you guessed it- the direction from side to side is horizontal and the direction from top to bottom is vertical. Careful timed sequences are implanted to assure these sync pulses are at the exact places so that each line trace is scanned properly. Two separate sweep (sync) signal pulses are used of different sizes to distinguish the differring horizontal and vertical scanning. In the USA (Japan, Canada and some other countries), each picture contains 525 lines which are sent 30 times per second. This makes the length of each line 63.5 microseconds long. 15,734 Hz. is the frequency. In rough terms, about 5/6th of a line is video information and 1/6th of a line is used for sync timing information. The video pulse is 4.5 microseconds long with a little time left over on each side to give the scanning system time to reach the proper sides of the TV screen. OK, now we have sent our first recognizeable picture. We now need to trigger the vertical sweep circuit to "return" the scan to the top of the picture so we can send another scene. Since it takes much longer to scan all the horizontal lines than the vertical ones, the vertical sweep has a lower frequency of 59.94 Hz. It actually only takes 21 horizontal lines to send all the vertical information, this is called the "vertical interval". It is the time from the end of the first picture to the beginning of the next one. "What's that?", 1100 microseconds specifically. In commercial broadcasting, this time period is best used to send more than just the vertical sync pulses. Special signals called VITS or VIR are inserted on some of the lines. Vertical Interval Test Signals and Vertical Interval Reference signals are used by station engineers to monitor the signal levels and distorion products. This technique can be used to then correct automatically and problems with the video pictures thereby providing a better picture to the TV "viewer".


If you delay the picture on your TV by ½ line and ½ field, you will see the vertical interval pulses as shown in this "pulse" cross diagram
A
B
C
D
A - Vertical Sync Pulses
B - Horizontal Sync Pulses
C - Equalizing
D - Vertical Serration



For our use in Amateur TV, we would not use these extra signals. In our inexpensive cameras, there are only horizontal and vertical sync pulses, part of which is a signal that is not used which is called blanking. Since we do not need to "see" the lines made from a beam that is not making a picture, we want to "blank" out that part of the electron signal that is not producing any part of the picture from the camera into our TV monitor. This method is also called RETRACE which is technically the time period just ahead and after the sync pulses during the blanking period, the time the beam is turned off. Well, I think that's enough basic TV video theory for now. For you ole' timers this is old-hat, but for us newcomers, it's vital information. Next month, let's talk about cameras! -CV.

Turn a few hours work into years of fun with Amateur Television.



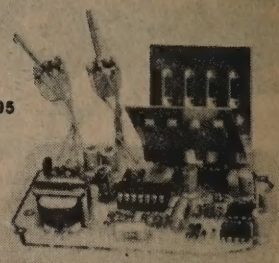
$34.95

ATV Converter *
Convert any TV receiver to a fast scan ATV monitor without incurring the expense of commercially made equipment. The Communication Concepts Inc. converter allows you to monitor 430MHz ATV signals using channel 3 or 4 on a standard TV set, without modification to the set. The kit consists of a low noise high gain RF amplifier (MRF-901), a double balanced mixer and a Varicap* controlled local oscillator. By using Varicap diode tuning, the converter can be placed directly at the receiving antenna and tuned remotely with a standard 10K potentiometer, if desired. This technique greatly increases the signal strength at the TV receiver by reducing the capacitive loss normally encountered when using high frequency signals on coax lines.
The converter requires an external 12 volt regulated power supply at 40 milliamps. For optimum performance, the converter should be mounted in a metal enclosure; thereby providing an RF shield.

ATV-1-PK Kit includes detailed step-by-step instructions, printed circuit board, and all electronic components as shown
ATV-1-PCB Printed circuit board only **$10.00**
ATV-1-I Instruction manual only. **$5.00**

***Circuit board design license authorized from P.C. electronics, Arcadia, California 91006**

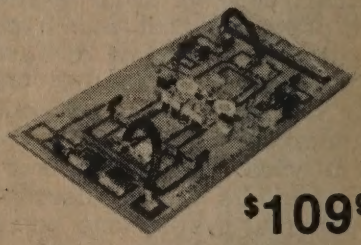
Audio Squelch Control
You have a squelch on your 2 meter equipment; why not add a squelch to your ATV monitor. Now you can avoid the major problem of operating ATV—the annoying hiss and static when the signal is not present. With the ATV squelch, you no longer have to turn the volume down when the signal disappears and risk the chance of missing a signal.
The squelch easily connects to the TV receiver audio stage without modification of the TV, since the squelch circuit contains its own audio output stage. You must provide your own speaker. Operator safety is provided by using transformer isolation between the receiver and the squelch circuit, thus eliminating the shock hazard when using a "hot chassis" type TV receiver.



$34.95

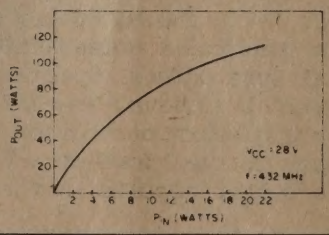
SIL-K Complete Kit—includes a detailed instruction manual, printed circuit board and all electrical components. Kit does not include case, speaker and regulated power supply (10 to 15 volts @ 250mA).
SIL-PCB Printed circuit board only.

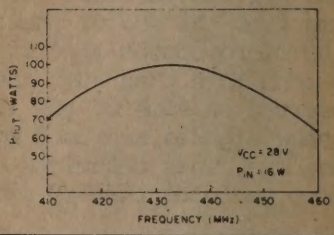
100 Watt Linear Amplifier
Now you can get on the air with a high power 100 watt class B linear amplifier for SSB-FM or ATV on the 420 to 450 MHz band and still not spend a lot. This kit is described in Motorola engineering bulletin EB-67 and is available in a number of configurations. For full output, a minimum of 16 watts is required for excitation with an input SWR of not higher than 2:1. Output will maintain stability with a 3:1 collector mismatch at all phase angles. A designed-in low-pass filter suppresses the 2nd harmonic to at least 63 dB down. An external power supply capable of providing 28 VDC, regulated, at 10 amps is also required.



$109.95

KEB-67-PK Kit includes detailed step-by-step instructions, printed circuit board, and all electronic components as shown.
KEB-67-PCB Printed circuit board **$14.00**
KEB-67-I Instruction manual only. **$5.00**





P.C. Boards

The FCC does not allow us to sell Broadband RF amplifier kits in the HF range, therefore we can only offer the printed circuit board and parts on a piece-by-piece basis.
140 watt power amplifier as described in Motorola engineering bulletin EB-63. **EB-63-PCB**
100-180 watt power amplifier as described in Motorola application note, AN-762. **AN-762 PCB**
300 watt power amplifier as described in Motorola engineering bulletin EB-27A. **EB-27A PCB**
Transformers, transistors and other parts are also available.

We also specialize in hard-to-find components.

In addition to our kits, we also stock parts for other Motorola application notes and engineering bulletins. We have an in-depth stock of Motorola VHF and UHF transistors, Underwood metal clad mica capacitors (Unelco), Kemet chip capacitors, Cambion RF chokes and Ferroxcube Ferrite beads and RF chokes plus other difficult to find parts. If you are having trouble finding a part, call us, we probably have it in stock.

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"AMATEUR TELEVISION MAGAZINE'S" 1982 NORTH AMERICAN FSTV-UHF CONTEST August 20 - 22, 1982

"OFFICIAL RESULTS"

W6VCF California Sweeps Top Honors Of All Contestants
WB0ZJP/W9ZIH "260 Mile" DX Contact!

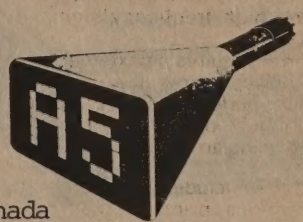
The "first annual" A5 Magazine NORTH AMERICAN FSTV-UHF CONTEST is now history! This was the first known Mexico/USA/Canada ATV Contest ever organized by a national publication. W6VCF Ron Olney of Encino, California swept "first place" overall operating "portable" from Saddle Peak Mountain (2,000 feet elevation ASL) in the Santa Monica Mountains of Ventura County (35 miles NW of downtown Los Angeles). All ATV gear (PC Electronics 2 watts average power into Cushcraft DX-420 array) was housed in a "motorhome" with power supplied by a Honda 3500 watt gasoline generator. Ron used a Sony KV8000 color receiver and a RCA-CC001 Color Camera. A 26" dish for 1250 Mhz. receive was also used. K6YGX Austin Bennett assisted W6VCF on the operation.

FAIR TURNOUT IN MOST AREAS OF U.S.A.

There were 37 official entries (2 reporting but not participating) from nearly all states in the USA. No entries were received from Mexico and only one from Canada. The single Canadian entry surprised us as we have a lot of loyal A5 subscribers in Canada-perhaps next year? Listed below, are the top 15 finalists; *indicates division leaders per district. All entrees will receive a gold A5 certificate suitable for framing;

A5 NORTH AMERICAN FSTV-UHF CONTEST ENTRY RESULTS

			POINTS SCORED
1.	*W6VCF	Ron Olney, Encino, California (Saddle Peak Mountain)	9,989
2.	*WA8RUT	Ken Morris, Columbus, Ohio	5.685
3.	WD8MRV	Richard Karr, Risngsun, Ohio	3,560
4.	*KBØXL	Mike Finley, Cedar Rapids, Iowa	3,015
5.	*WB9MCF	Ron Pribe, Burnside, Illinois	1,955
6.	*W2RPO	Ralph Janowsky, Lockport, New York	1,907
7.	WBØZJP	Dave Williams, St. Louis, Missouri	1,905
8.	WA9NJR	Ron Hines, St. Paul, Minnesota	1,895
9.	*VE3FYY	Julius Csatanv, Grimsby, Ontario, Canada	1,621
10.	W6RVP	John Dieringer, Los Angeles, California	1,620
11.	W2WHK	Don Fuller, Tonawanda, New York	1,496
12.	WA8SAR	Gary Obee, Lambertville, Michigan	1,494
13.	K8HVA	Guy Cunningham, Plymouth, Ohio	1,445
14.	KAØBVT	Don Hartman, Moscow, Iowa	1,225
15.	W8EVH/Ø	Ernest Simon, Minneapolis, Minnesota	835



SOME INTERESTING CONTEST DETAILS

Longest distance ATV-DX worked; WBØZJP (Missouri) to W9ZIH (Chicago, Illinois) 260 miles, Black-White video with sound (on-carrier audio). Most Color ATV stations worked; W6VCF - 27, Most ATV stations worked, W6VCF - 37, Number ATV stations that worked full 2-day contest period; 17, Longest time contact; KAØBVT/WBØQCD 2 hours.

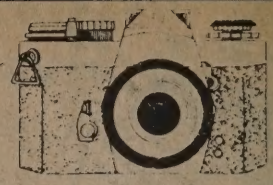
CONTEST CRITICISM

Your written comments were very helpful. Designed for a DX Contest, long-range ATV contacts were not given proper point credits. The "P-level" multiplier is okay but the DX "addition" should be in a range multiplier. It was possible for P5 Color TV contacts less than 10 miles to outscore P3 BW DX contacts of over 200 miles. The "base" point descriptions need to be better explained and catagorized, hours will be changed to include an extra morning period by extending perhaps to 72 hours.

FEBRUARY 1983 "A5 QSO PARTY" ANNOUNCED

The "basics" of a good, fun operating FSTV contest are there. Most of you said you couldn't wait till next year. Why wait? Announcing an "A5 ATV QSO PARTY" Contest in February! Watch our December and January issues for details! Thanks for participating!

THE CAMERA CORNER



"YOU MUST MENTION THIS AD IN A5 TO GET THESE SPECIALS...ASK FOR TOM!"

PENTAX PCKOO3A ZOOM 6x1 COLOR CAMERA

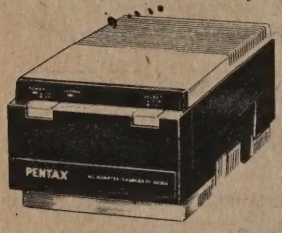
SPECIAL PURCHASE...ONLY $399!

"JUST IN TIME FOR CHRISTMAS"

This is the same color camera that was reviewed in the September Issue (Page 11) of A5 Magazine. Made by Hitachi (GP4ID), This color video camera features 6x1 motorized zoom lens (Macro) for great closeups, 1.5" mini-TV screen for live viewing and video recorder playback, front and back audio microphones, automatic iris, manual color balance controls with led readouts and many more features. Standard C-mount with removable handle grip for tripod mounting. Unit may be powered from any VCR supplying voltage to camera. Hours of fun and enjoyment for FSTV amateurs or color SSTV enthusiasts!

(Some stock may have original HITACHI labels)

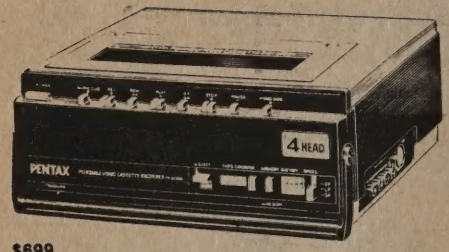
PC-KOO3A Color Camera



PV-AO2OA Adapter $109.88

Panasonic WV-3203 Camera AC/DC Power Supply (same as RCA Model) - Powers 12 VDC to any video camera (standard 10 pin female connector), RCA phone jacks for video/audio, $49.88 (Save! Build your own, see A5 ATV Book, Page 61!)

PENTAX PV-AO2OA AC Adapter/charger supplies voltage to portable VCR Unit and recharges NICAD Batteries in place of tuner.



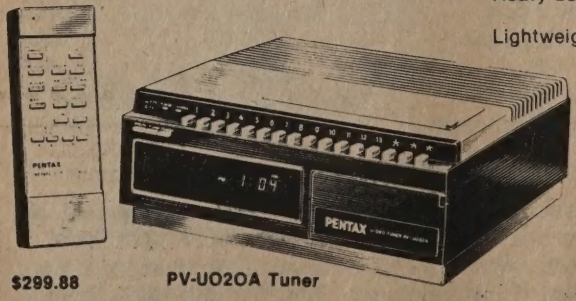
$699

Portable VHS Recorder

This Pentax VHS format portable video recorder utilized 4 heads for superb color resolution at 2-4-6 hour speeds! Lightweight with video and audio dubbing capability and many standard features found on more expensive systems, this video system when combined with the PV-UO2OA Tuner creates an excellent home video center, Attach your ATV down converter to the tuner, set it on channel 3-4 and record and "Instant Replay" those live FSTV contacts! Much improved video storage method for SSTV operation over Poor quality avoid recorders.

Other Video Accessories:

- Smith-Victor Tripods
  Heavy duty model 2000GLB $59.88
  Lightweight model HS102 $24.88



$299.88

PV-UO2OA Tuner

"GET YOUR ATV GROUP OR CLUB TOGETHER AND STOCK UP ON THIS GREAT BUY ON TAPE!"

MEMOREX

VHS T-120

WOW!. . .$9.99

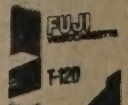
Shipped UPS Prepaid!
Case lots of 10 only

FUJI Blank VHS

T-120 REG. $18.95

NOW. . .$12.44 ea.

Case lots of 10 only
Shipped UPS Prepaid!



(NO TAX TO OUT OF STATE BUYERS)

Buy all 4 Pieces and get this video system carrying luggage Free!

- **Recoton VCR TV signal amp V-310 increases TV signals 10DB $21.95**
- **35 mm lens to CCTV camera adapter for Minolta, Cannon, Nikon, Pentex and Olympus Cameras $19.95**

ALL ITEMS WE PAY UPS SHIPPING!

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"COMPLETE LINE OF CAMERAS, PHOTOGRAPHY AND VIDEO EQUIPMENT"

ATV VIDEO DISTRIBUTION AMPLIFIER

by Frank Wolczak WA0IWF
3120 U Street
Omaha, Nebraska 68107

Video Distribution Amplifiers allow a video signal to be distributed to a number of places. In the Amateur ATV shack, one signal may be made available to a number of places (monitors, video recorders, transmitter, etc.) without degradation in levels or quality. The circuit presented, allows the builder to make a video DA with a very small amount of parts. As many as six outputs (or more) are possible. The amplifier circuit is straightforward with a simple power supply. Substitute power supplies may be used as long as you have +/- 6.2 vdc. I personally have built and used six of the DA's (rack chassis mounted) and powered them from the power supply in Fig. 2.

U1 is a high-gain op-amp which feeds driver U2. Feedback is provided to U1 and the frequency response (chroma-gain) is adjusted by C1. If you would like to etch your own circuit board, a negative is available for both the DA and the power supply. (Send $2.00 and a SASE). Construction is not critical and can be made on a perfboard if the builder so desires. There is no adjustment for the DA output. Check output with scope or waveform monitor for 1 volt p-p. Adjust value to R1 to R6 as necessary. Testing the DA by feeding color bars or multiburst test signals will show excellent results. Differential phase and gain is acceptable for Amateur ATV work. Good Luck! -WAØIWF

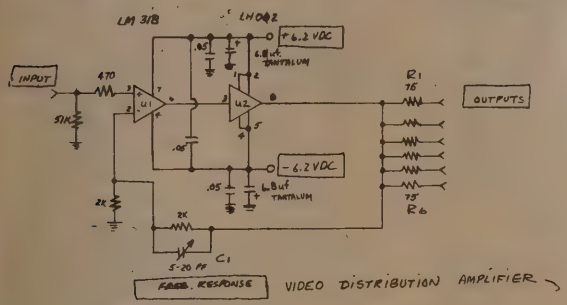

Fig. 1 Video Distribution Amplifier

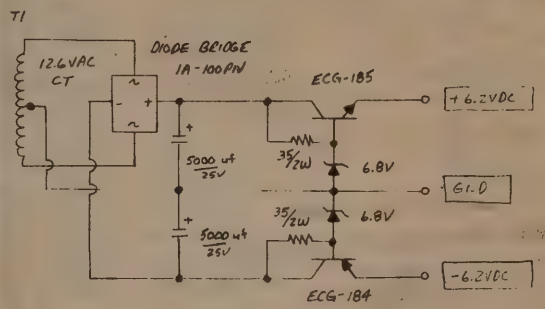

Fig. 2 Power Supply

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1982 "MIDWEST" A5 UHF-ATV CONFERENCE HELD
PLANS ALREADY UNDER WAY FOR NEXT YEAR!

Holiday Inn Peoria, IL. Welcome ATV'ERS Sign

All the planning since March finally paid off as FSTV operators from all over the midwest gathered for the 3rd annual Midwest ATV Conference sponsored and hosted by A5 ATV Magazine. The September 17th meeting was tied into one of the best midwest hamfests in Peoria, Illinois on Sept. 18th & 19th. Eight speakers were on the program including demonstrations, slide shows, displays, prizes,an air-mobile FSTV flyby, live TV two-way stations, UHF WMBD-TV (31) Tour, homebrew equipment contest, video-recording session and a great Dinner-Banquet with a guest speaker. Many of the conference guests stayed at the Holiday Inn (Holidome) complex and relaxed afterwards in Sauna Whirlpools and the large swimming pool. It is rumored that 3 men climbed over the locked iron gates that protect the bathing areas and partook of the facilities after hours (2 am. Friday), but this could not be substantiated by A5. Guests began arriving as early as Thursday night with a riverside restaurant late evening meal following an informal cocktail hour. WBØQCD was Master of Ceremonies and presented the conference speakers and organized the activities. K9ILA and W9LII were invaluable in their efforts to make the ATV gathering run as smoothly as possible. The W6ORG FSTV California demonstration tape led off the meeting, followed by a short talk by WBØQCD on "having fun with ATV" where a videotape was run of Mike's somewhat questionable ATV Commercials including cartoon characters calling CQ ATV, a Friskie Cat Food Commercial with a great ending, a shaving cream and under-arm deodorant commercial and a special effects illusion unique to ATV'ers. K9ILA showed low-price UHF-TV monitoring antennas for under $12.00, Dr. Don Miller W9NTP talked on the future of ATV modes, John Beanland of Spectrum International traveled all the way from Massachusettes and talked about ATV Filtering techniques (with blackboard drawings), the wives left on a shopping tour at 11 am., John Greve W9RI-Illinois demonstrated a TRS80C computer and ATV graphics with an open lunch at 2:30 pm. The conference attendees had to eat fast and reassembled at the Hotel's lobby for transportation to WMBD-TV (Channel 31 UHF) and a complete studio tour which was very interesting. A 6 pm. Dinner/Banquet (5 course meal) kicked off the evenings festivities followed by W9NTP's short talk on keeping the wives happy in Amateur Radio. WBØQCD announced first word of on-going communications with CableSat in Florida in the possibility of an Amateur Radio FSTV Satellite. The 8 pm. night meeting was kicked off by Warren Weldon W5DFU-Oklahoma with his slide show on Public Service ATV and G-line Microwave linear amplifiers. Ron Priebe WB9MCF won the A5 "Bullshippers" Award, Bill Ditch WB9WST won a "booster" award with an audience participating "Diddlers" Award going to Don Hartman KAØBVT of Moscow, Iowa (it was rigged!). Bad weather cancelled the ATV Flyby session on Friday afternoon and was rescheduled on Saturday with Mike Freitag N9CRN from Burbank, Illinois "buzzing" the Peoria hamfest grounds sending live Color FSTV pictures to the W9LII ATV ground station with many onlookers. The ATV talkin frequency used was 144.34 Mhz. FM including the Sunday 18 mile live demonstration from K9ILA in Pekin, Illinois. 3 video movies were run on the hamfest site for overnight campers followed by a "private" showing of the usual Friday night ATV cartoons which kept a few up to nearly 1 am. on Saturday night. A very interesting "ragchew" session concluded the ATV Conference on Friday night with suggestions of things to make the next one in 1983 even better. Peoria will again be the site in 1983 with a Saturday meeting period to allow more ATV'ers and non-ATV'ers to attend. After 1983, the Midwest

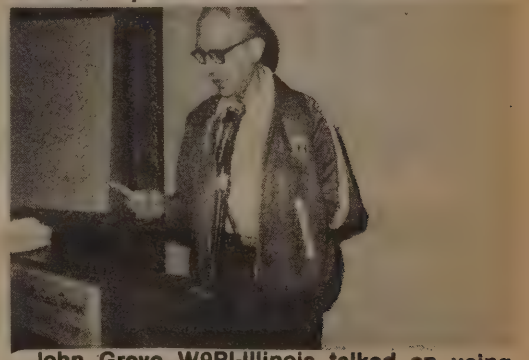
Dr. Don Miller W9NTP-Indiana talks on history and future of ATV modes.

John, Spectrum International teaches ATV Filter theory techniques.

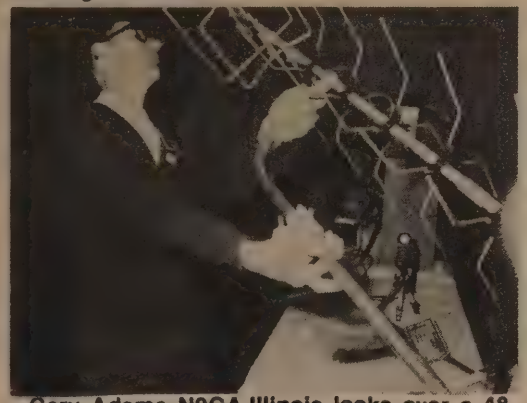
John Beanland G3BVU England Mass. WB0QCD present PSF432 filter to K9ILA.

The conference was filled with all day and evening attendees.

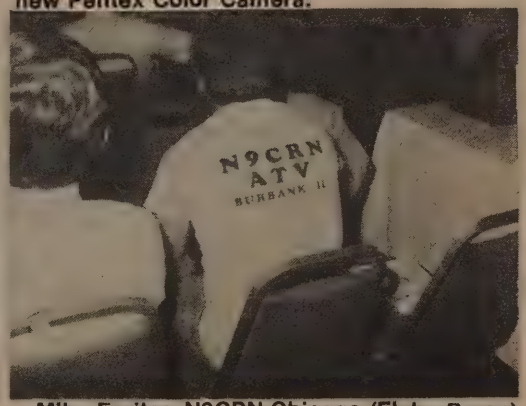
Ron Priebe WB9MCF-Illinois tries out his new Pentex Color Camera.



John Greve W9RI-Illinois talked on using computers for ATV modes.



Gary Adams N9GA-Illinois looks over a 48 element J-Beam antenna from Spectrum



Mike Freitag N9CRN-Chicago (Flyby Baron) listens to one of the many speakers.

Joe WA9CGZ shows off his winning ATV XMTR entry.

Conference Hombrew Equipment Table.

Warren Weldon W5DFU-Oklahoma had a slide show presentation on Public Service and

Dan Person VE3KRO and YL flew in from Thunder Bay, Ontario, Canada!

George Stever WB9LVI-Wisconsin demonstrated high resolution SSTV

Tom Hibben KB9MC-Wisconsin demonstrates Color and Motion SSTV

K9ILA "Leads the way" to the A5 Open-Bar area.

Tom Barbour W9LII-Illinois showed live FSTV Color 18 miles from hamfest site

Saturday Peoria Hamfest ATV Flyby demonstration crowd.

Hungry ATV'ers at the evening Dinner Banquet.

MIDWEST ATV CONFERENCE CONTINUED...

A5 ATV Conference will begin to rotate to other locations with perhaps the Milwaukee area hosting it in 1984. The 3rd Annual ATV get-together was indeed very successful as far as planning, speakers and the "show" in general, but was a bit disappointing in the turn out of attendees. 100 was the goal for this year's conference attendance with alot of advanced publicity and preregistrations. An accounting of money spent and received revealed that a hefty loss was incurred by A5 Magazine largely due to the low actual attendance (47) and necessary conference costs to put the affair on. It is hoped like in many beginning events, that the annual Midwest ATV Conference will turn this around in future meetings and become self-supportting. It was generally agreed by those attending this year's session, that the quality of the meeting was great and that once testimonials filter out to the non-attending ATV crowd along with rescheduling for a weekend meeting time-the conference will surely pick up in attendance figures.

Statement of A5 Midwest ATV Conference
Financial Credits & Debits

Credits	Amount	Debits	Amount
Ticket registration sales (38 paid-47 total includes wives and non-paying guests)	$640.00	Banquet Meal Expenses	$468.00
		Coffee (3.4 gals)	31.50
		Sweet Rolls (36)	30.60
	$640.00	Food Tax	39.25
		Gratuity	84.11
Meeting room facilities furnished at no charge if 40 meals/50 rooms filled at Holiday Inn. 48 meals were paid for and 27 rooms filled.		Beanland Room expenses	155.52
		Weldon Room Expense	51.84
		Slide Projector rental	18.00
		Liquor, Beer, Pop, Misc.	105.75
		Hamfest tickets (50)	150.00
Debits	$1265.07	Awarded prizes	120.00
Credits	640.00	Prior phone call expenses	10,50
Net loss	-625.07		$1265.07

* *

"COMMENTS"

"We'll here it is Monday, it's all over. I can't begin to put in words the enjoyment I had at the UHF Midwest ATV Conference! I think the choice of speakers was fantastic. They were all very good; but two really left an impression on me; John Beanland and Warren Weldon-both fantastic fellows. It sure was enjoyable meeting all the ATV'ers that we have been working or looking for the past couple years. I was telling W9LII just the other morning that I had an empty feeling-you know the kind when you've just come back home from an enjoyable vacation and begin to realize it's over? Tom said he felt the same way. Thanks Mike and A5 for a wonderful weekend and a super fine ATV UHF Conference/Hamfest at Peoria, Illinois!" -Pat Pratt K9ILA, Pekin, Illinois

"I thought alot on the plane trip back home from Peoria about all the different subjects we had covered and all the great Midwest ATV'ers we exchanged ideas with. You can count on us back next year!" -John Beanland G3BVU, Spectrum International, Mass.

"We had a great time meeting all you ATV'ers at Peoria. It was a long trip but we take back with us some new friendships. Hope we can get some FSTV going up here! Dan Person and XYL, VE3KRO, Thunder Bay, Ontario, Canada

"I'd like to thank K9ILA and W9LLI for helping at this year's ATV Conference. Hopefully after 3 years-we will have stirred some interest in the Peoria area? I was very disappointed with the local Peoria turnout and hamfest forum attendances. The A5 pocketbook has a hole in it, but the enjoyment and fun was worth the trip." Mike Stone WBØQCD

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- SA-1 SYNC AMP FOR SOLID STATE LINEAR AMPLIFIER USE.
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$399.95 + $4.50 UPS

Add a camera, antenna, mic, 13.6vdc and a TV set for a complete fast scan ATV station.

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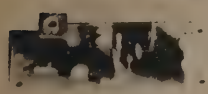
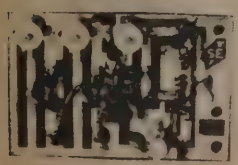
ATV KITS AND MODULES

VM-2 **VIDEO MODULATOR** – Wideband collector video modulator for solid state exciters such as those from GLB and Hamtronics. Input for 4.5MHZ audio sub-carrier. 2½" x 1½"; **$13.95** kit, **$18.95** assembled.



A-2 **4.5MHZ AUDIO SUB-CARRIER** – Accepts audio from VCR or GLB audio processor to provide ATV audio on TV set. Has on-board voltage regulator and shielded inductor. 2 3/4" x 1"; **$18.95** kit, **$24.95** assembled.

SA-1 **VIDEO SYNC AMP** – Provides separate video sync gain control for VM-2 above or SE-1a transceiver. Useful when driving solid state amps. 1 3/4" x 1 1/4"; **$14.95** assembled, **$11.95** kit.



DC–1 **UHF CONVERTOR** – Varactor tuned with 2 RF stages. MRF901 input standard. Double sided stripline design. Outputs to TV ch. 2, 3 or 4. Can be tower mounted. 11 – 14vdc. 2" x 3". $34.95 kit, **$49.95,** assembled, **$79.95** complete in box. Add **$15.00** for NE64535 1st stage.

P-1 **WIDEBAND LOW NOISE UHF PREAMP** – Uses MRF901 transistor to provide 16db gain and 1.7db noise figure. Covers 420–450MHZ band. Other frequencies received with change in input inductor. 2 1/4" x 1 3/8"; **$17.95** kit, **$26.95** assembled. Add $15.00 for NE64535 Option.

LA-1 **UHF AMPLIFIER** – Uses 15 watt MRF641 transistor with 7.8db gain @ 470MHZ. Stripline inductors with on-board pin diode antenna switching for a receiver. Designed for wideband color video with exciters such as the GLB T450L that provides up to 3 watts drive. Drilled and tapped heatsink included (4 1/2" x 1 3/4"). 1 to 3 watts drive typically gives 6 to 18 watts output. 12 – 14vdc operation @ 4 amps max. Double-sided board is 4 ½" x 2". **$69.95** assembled with test data.

LA–45 UHF AMPLIFIER – Uses MRF646. Input power of 6-15 watts typ. gives 20-50 watts output. Biased for linear operation. Kit includes all parts, instructions and 4.2" x 3" double-sided stripline board. Needs 12-14 vdc @ 9 amps max. **$59.95** kit.

GLB T450L TRANSMITTER – 4 1/2" x 2" RF board typically supplies 2–3 watts FM output, 1 – 1½ watts average video RF output. Changes for wideband video modulation provided. Comes with crystal for 439.25MHZ, with other frequencies available upon request. Also includes separate 1" x 4" audio processor board which supplies audio for FM modulation or for the A–2 4.5MHZ audio kit above. 12–14vdc @ 2 amps max. **$54.95** kit, **$74.95** assembled and tuned.

COMMON TO ALL KITS AND MODULES – 12 to 14 vdc operation. Drilled and plated glass circuit boards. Quality components with instructions including schematic and board layout.

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Channel 15

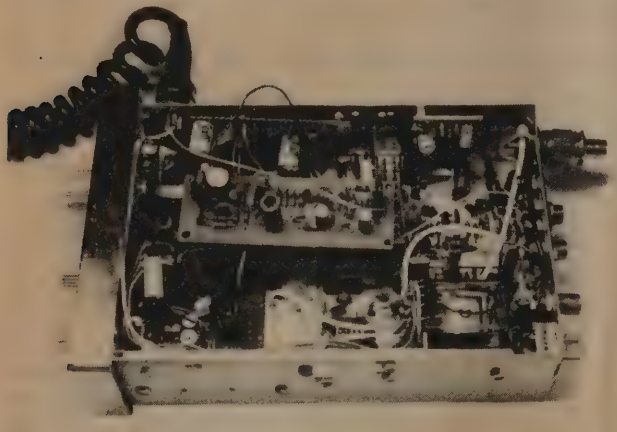
CONVERT YOUR REGENCY HR-440 FOR FSTV!*

SOLID STATE PUSH TO LOOK ARRIVES!
by Bruce J. Brown WB4YTU/WA9GVK
4801 Kenmore Ave., Apt. 1022
Alexandria, VA 22304

Are you tired of using your tube ATV rig as an auxilliary room heater? Is your rig taking up valuable space that could be better used for storage of your porno magazine collection? Does everyone think your rig looks like a booby prize won at a ham-fest raffle? Are you tired of searching through surplus store garbage cans for final amplifier tubes? Have you been afraid to get into amateur television because of the above? If your answer to any or all of the above is yes, then the ATV Modified Regency HR-440 is for you!

It is not only a compact, solid-state, 10 watt-average TV transmitter, but has a squelched audio receiver, to boot. It's adaptable for simplex and/or repeater operation and is compatible with the popular "audio" on the video carrier" format. You can even operate ATV from your car or in the field with a rechargeable battery.

This article details the modification procedure necessary to use an HR-440 for fast-scan amateuf television use. Approximately $25 in parts and 5 hours of labor, using proper tools, are required to implement the conversion.



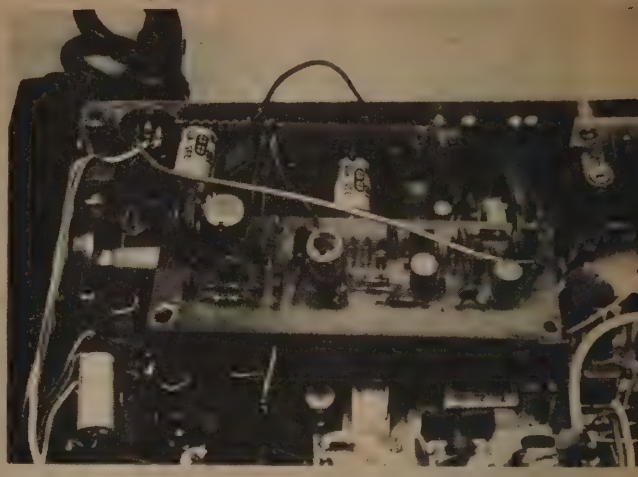
HR-440 modified for ATV.

SALIENT FEATURES

Size: 2 1/4 x 5 1/2 x 7 1/2 inches
Power Requirement: 12 VDC @ 4 Amps (max) All solid-state
Transmitter:
Power Out: 10 watts-average video
Video Input: o.5 to 2.0 V P-P composite, negative sync
Video Freq. Response: 4 db down at 4.2 Mhz
Audio Format: 5 khz dev. FM on video carrier
Frequency Range: 420-450 Mhz, internal adj.
TV (Video + Audio) or FM (Audio-only) selectable by front panel switch Receiver:
Audio Format: 5 khzdev. FM
Video: External TV receiver and converter required
Frequency Range: 420-450 Mhz, internal adj.

Simply add antenna, camera, receive converter, TV set and 12 VDC-4A power source for complete fast-scan amateur television station.

GENERAL MODIFICATION APPROACH



Close up view showing video modulator mounted on wall. PC board in center is 4.5 MHZ sub carrier sound unit from PC Electronics. Sound sub carrier added not mentioned in text, output goes to input of pot in center of video modulator through 1K ¼ watt resistor.

TRANSMITTER (Figures 1, 2, and 3):

Video amplitude modulation of the carrier is achieved through collector modulation of the driver stage immediately preceding the Motorola MHW-710 power amplifier module. This is accomplished using a video modulator board added internally in the rig. A somewhat linear output signal is possible due to the output vs. input performance characteristics of the module operating in the 7 to 10 watt region as shown below.

Although true linearity is not achieved, few, if any, will be able to detect the slight non-linearity when viewing the picture. Most noticeable, when observed on an oscilloscope display of the detected RF, will be compression of the sync tips (highest power levels). Again, this is not a problem since the majority of amateurs use compressed or clipped sync anyway to achieve a greater average power level from their transmitters. (Most TV sets are capable of locking up to a picture exhibiting very low sync pulse level.)

This modification scheme results in amplitude modulation of the carrier, for video, and frequency modulation of the same carrier, for audio. Since a TV receiver can not receive both the picture and audio simultaneously unless the audio is located 4.5 Mhz above the video carrier, a separate receiver tuned to the carrier must be employed to demodulate the audio from the 440. Such a receiver is available in the HR-440.

RECEIVER (Figures 2 and 3):

The HR-440 relay-to-receiver wiring is modified to permit the bulk of the received signal from the antenna to be routed ultimately to a TV receiver (via connector "K") for video display. Using an external coupler, a small portion of the signal is fed into the HR-440 receiver (via connector "R") to provide television audio.

*Reprint from "ATV IN A NUTSHELL" 1978 by Henry Ruh

REQUIRED TEST EQUIPMENT

1. UHF wattmeter (Bird 43) with 50 ohm dummy load. (50 feet of RG-58 into a Heaht Cantenna results in a good UHF load.)
2. 20,000 olhms per volt (or greater) VOM

REQUIRED MODIFICATION TOOLS

1. 30 watt soldering iron and 60/40 solder
2. Diagonal cutters
3. Needlenose pliers
4. Wirestrippers
5. Screwdriver (to tighten No. 4-40 screws)
6. Jewelers screwdriver
7. Nutdriver set (Radio Shack 64-1800; $3.29)
8. Desoldering tool or remover wick (Rado Shack 64-2090; $1.49)
9. Variable speed electric drill with the following bits:
   a. 3/32" (optional hole starter)
   b. 1/4"
   c. 3/8"
10. File (to clean burrs from holes)
11. 1/2" wrench (for tightening UG-1094 nuts)
12. RTV or nut-tightening solution
13. Ruler

REQUIRED TUNE-UP TOOLS

1. 0.1" plastic hex wrench (Heathkit or GC)
2. Thin phenolic screwdriver or insulated screwdriver with thin metal tip.

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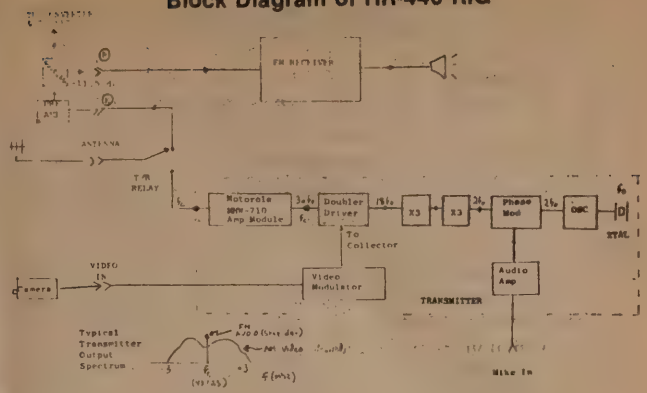
Block Diagram of HR-440 RIG



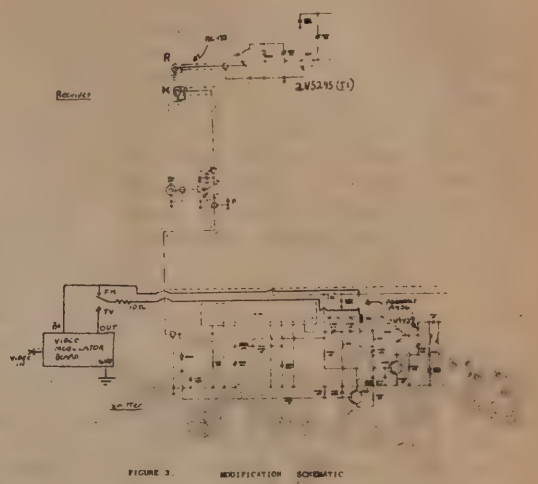


FIGURE 3. MODIFICATION SCHEMATIC

MODIFICATION PROCEDURE

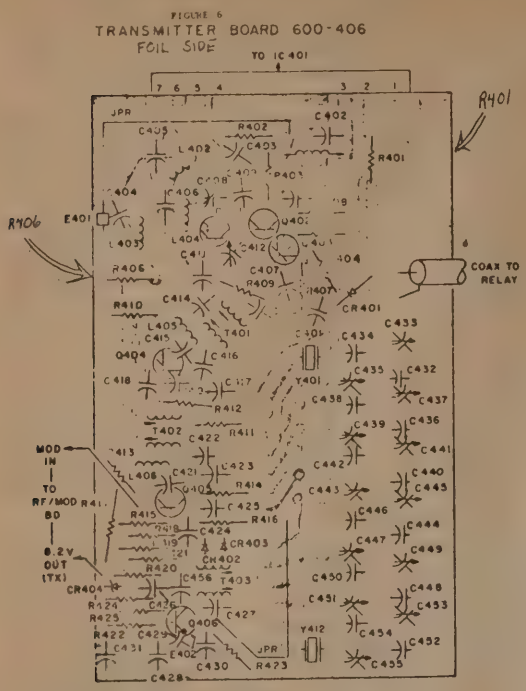
Before proceeding, make sure the rig is operating properly using the 446.0 Mhz crystals supplied. Immediately order the crystals for amateur television operation in your local area. Delivery is approximately 1 month; See Parts List.

1. Remove transceiver cover by unscrewing the two large bolts at the sides.
2. To remove speaker, unscrew the two small metal screws (one on each side) holding the speaker bracket. Carefully place the speaker assembly along side of the unit.
3. Locate R401 on the Transmitter Board; See Figure 6. Check its value. If it is 150 ohms, as was installed in the first factory production run, replace it with an 82 ohm, 1/4 watt resistor. This factory authorized modification desenses the VSWR limiting circuit to improve output power levels into slightly mismatched antenna systems. Reinstall speaker.

THE WARRANTEE WILL BE VOID UPON IMPLEMENTING THE FOLLOWING MODIFICATION PROCEDURE

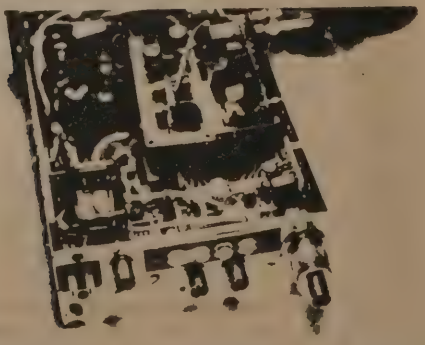
4. Turn rig over so that foil side is facing you. Locate R406 (10 ohms) on the Transmitter Board referring to Figure 6. Using a soldering iron with a desolering device, remove solder around both R406 leads. Alternately apply pressure to each lead using the soldering iron tip to allow the resistor to drop from the PC board. You can use a lead from a spare 1/4 watt resistor to help push the R406 leads

through. SAVE R406. You will use it later. Make sure both holes are completely clear of solder.

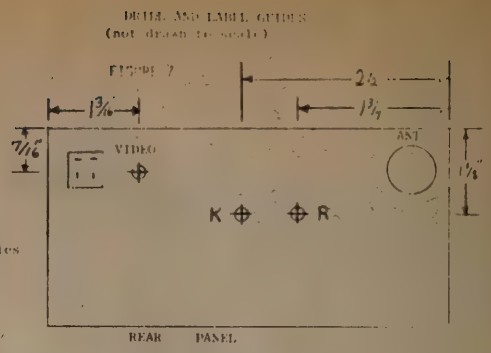


APPROXIMATE TIME, STEPS 1-4 = 1/4 hour

5. Using Figure 7, very carefully drill three 3/8" holes in the rear chassis. A smaller drill size, such as 3/32", may be helpful to initially start the hole. When drilling, hold chassis securely and with foil side up to prevent metal particles from falling into the electronics. Clean burrs from holes with a file and apply labels "Video", "K", and "R" as shown in the Figure.
6. Insert three UG-1094 connectors into the holes. Loosely mount them with the lockwashers and nuts supplied. Do not tighten. Tin, with a soldering iron and solder, a portion of the grounded edge of the UG-1094 "K" and "R" connectors. See Figure 8.
   It will probably take several minutes to develop enough heat to permit a good solder flow. (The tinning operation will permit RG-188 shields, described later, to be properly terminated to ground.) Tighten all three connectors with a 1/2" wrench making sure that the tinned regions are facing up.

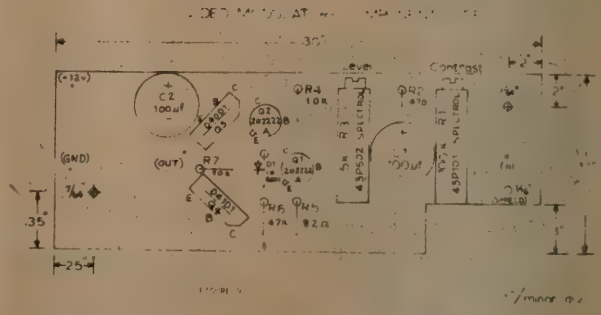


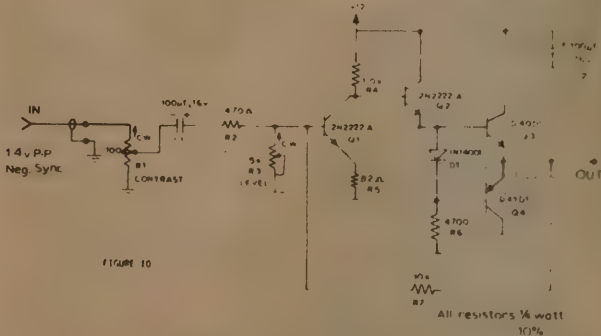
Rear view of modified HR-440 showing video and RF connections.



APPROXIMATE TIME, STEPS 5 and 6 = 1 hour

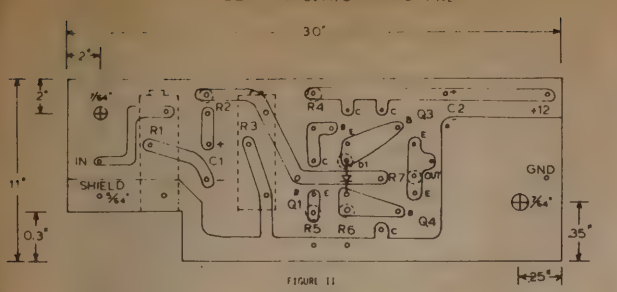
7. Mount all components to the video modulator PC board as shown in Figure 9, noting the following:
   a. Double-check polarities of the 100 uf capacitors, D40D1 and D41D1 transistors and the 1N4001 diode.
   b. Seat both pots as close as possible to PC board.
   c. Clip off tabs of D40 and D41 transistors.
   d. The diode and all resistors are mounted vertically.
   e. Keep leads short and solder globs small on the foil side of the board.
8. Add wires to the video modulator board as follows:
   a. Strip 1/2" insulation of a 10" length of RG-188. Separate center conductor and shiled. Strip 1/8" insulation from center conductor. Solder center conductor to "IN" on board and shield to adjacent ground hole.
   b. Solder 8" of insulated No. 24 solid wire to "OUT".
   c. Solder 8" of insulated No. 24 solid wire to "B+".
   d. Solder 1" of insulated No. 24 solid wire to ground hole provided near "B+" hole.

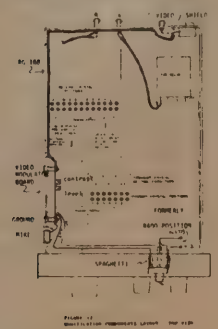




SOLID STATE PUSH TO LOOK ARRIVES! (continued)

MODIFICATION PROCEDURE (continued)





APPROXIMATE TIME, STEPS 7 and 8 = 1 1/2 hours

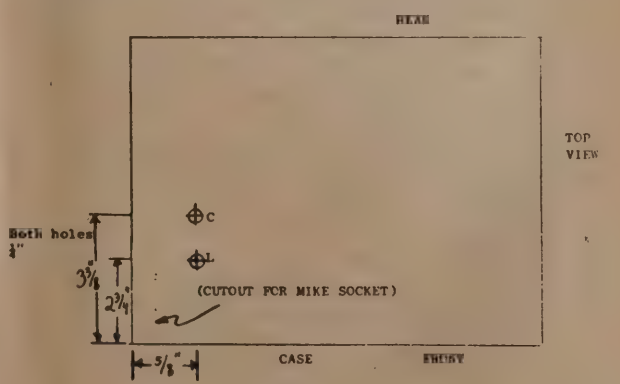
9. Remove speaker. Mount the video modulator board inside the rig on the left side wall (with front of rig facing you), as shown in Figure 12. Existing holes in the chassis wall are used. Use two 1/2" long flat head No. 4-40 screws, No. 4 spacers 1/8" long, lockwashers and nuts. Video modulator board foil faces the chassis wall; pot adjustments facing up. Put a dab of RTV (or similar solution) on the nuts after they are tightened to prevent them from loosening and falling into the rig under severe vibration.
10. Connect the RG-188 cable from the video modulator board to the "Video" BNC connector on the rear. Shield is soldered to the ground of the adjacent power connector. Route cable along the side and rear walls.
11. Solder the 1" wire from the video modulator board (ground) to the grounded terminal of the near-by microphone connector.

APPROXIMATE TIME, STEPS, 9, 10 and 11 = 1/4 hour

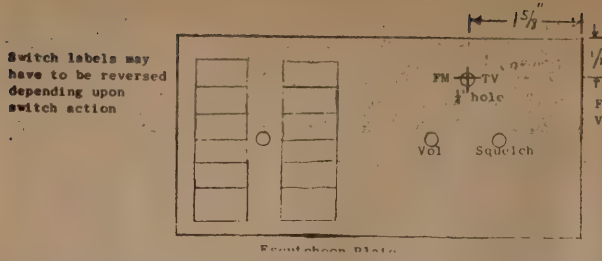
12. In order to mount the front panel mode selector switch, pull off the three knobs on the front panel. Using a jewelers screwdriver, pry off black escutcheon plate which is glued to the chrome-plate bezel. As shown in Figure 7, drill a 1/4" hole and mount a miniature SPDT toggle switch.
13. Route wire from "OUT" on video modulator board along the upper, inside edge of the front wall. Direct the wire-end through the hole located above and between the volume and squelch pots so that it protrudes through the front of the rig. Place a 1/2" piece of spaghetti over this wire and solder it to the miniature switch as shown in Figure 12. Push spaghetti over contact.
14. Solder one end of a 10 ohm resistor, namely R406 removed in Step 4, to the center terminal of the switch. Solder the other end to a 4" piece of insulated No. 24 wire. Use a large piece of spaghetti to completely cover the resistor and solder joints. The other end of the wire is soldered to the plated-through hole in the transmitter board, formerly occupied by R406, that is electrically connected to L403. It is the hole furthest away from the wall. See Figures 6 and 12. The resistor and wire should also have been routed through the same front panel hole described in Step 13.
15. Solder one end of a 4" insulated No. 24 solid wire to the remaining R406 hole (B+) and route it along with the wire from "B+" on the video modulator board through the front panel hole described in Step 13. Slip a piece of spaghetti over both wires and solder to the remaining contact on the switch.
16. Replace front panel escutcheon plate onto the chrome-plated bezel and replace all knobs. Use a VOM as a continuity tester to determine the switch position which shorts the center switch contact to "OUT" on the video modulator board. Label this position "TV" on the front plate and the other position "FM".

APPROXIMATE TIME, STEPS 12 through 16 = 3/4 hour

17. Using a solder removal device, remove the center conductor and shield of the white coax cable terminated on the receiver board near the antenna connector. Do not unsolder this cable at the relay end. Re-solder this cable to the RNC connector "K" installed in Step 6. Solder the shield to the tinned portion of the RNC. You may have to keep the soldering iron touching the connector for a considerable period to develop enough heat to solder the shield.
18. Connect a 3" length of RG-188 between the receiver board holes emptied by Step 17 and BNC connector "R" installed in Step 6. Connect shield as described in Step 17.
19. Bend both speaker terminals 90 degrees inward using a needlenose pliers (to provide sufficient clearance for video modulator board components after the speaker is mounted.)
20. Drill two 1/4" holes on top of the case and label as shown in Figure 7.



*21. Carefully loosen relay by removing two screws on chassis side. Completely wrap relay in copper foil and ground to relay support bar. Re-install screws and secure relay in original position.



APPROXIMATE TIME, STEPS 17 through 21 = 1 1/4 hours
EXCEPT FOR FINAL TUNE-UP, THE MODIFICATION IS COMPLETE – TOTAL APPROXIMATE TIME = 5 hours

22. Follow procedure in the TUNE-UP Section.
23. Re-install speaker. The large cut-off end is adjacent to the relay.
24. Re-install case on rig.

*This step reduced interference to received video picture caused by HR-440 receiver local oscillator emissions.

TUNE-UP PROCEDURE

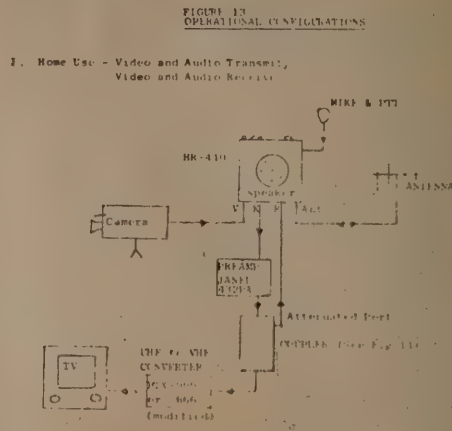
Install crystals for television frequencies in your local area (typically 439.25 Mhz transmit. 439.25 Mhz simplex receive, and 427.25 Mhz repeater receive). Follow installation instructions detailed on page 9 of the HR-440 Owner's Manual.

A. Transmitter

1. Retune transmitter as described on pages 12 and 13 of the Owner's Manual using a UHF wattmeter with dummy load. A 20,000 ohms/volt VOM may be used in lieu of the VTVM specified. IMPORTANT: Both leads of the VOM or VTVM must be floating with respect to ground. The front panel mode switch should be in the "FM" position for this initial tune-up.
2. Set the "C" or contrast control (accessible from the top of the case) fully counterclockwise (CCW).
3. Set the "L" or power level control fully clockwise (CW).
4. Set the mode selector switch on the front panel to the "TV" position. The rig should now operate as it did in the "FM" position (or as it did before modification).
5. Connect the video output of a TV camera producing a 0.5 to 2.0 volt peak-to-peak signal to the "Video" connector on the back of the rig.
6. Using the wattmeter, turn the "L" control counterclockwise (CCW) until 10 watts is read. (The rig will initially output about 15 watts into a matched load from a cold start.)
7. Viewing the picture on a converted TV set, turn the contrast control "C" clockwise (CW) until a picture starts to appear on the screen. Recheck the output power and if necessary readjust "L" for 10 watts. Keep turning "C" clockwise until a good picture appears. Readjust "L" for 10 watts.
8. Re-peak C405, C408, C412 and the top of T401 for maximum output power. Set C408 slightly counterclockwise (CCW) past its peak and the top core of T401 slightly clockwise (CW) past its peak.
9. Repeat Step 7 if necessary.
10. Once on the air, using an antenna with a through-line wattmeter and a remote receiving station to watch your picture, the rig can be properly fine tuned to provide an excellent quality picture.

NOTE: Do not set "C" too high or you will cause cut-off or buzzing on the audio channel.

Receiver – Follow procedure on page 11 of the Owner's Manual with the signal generator connected to "R" on the rig.



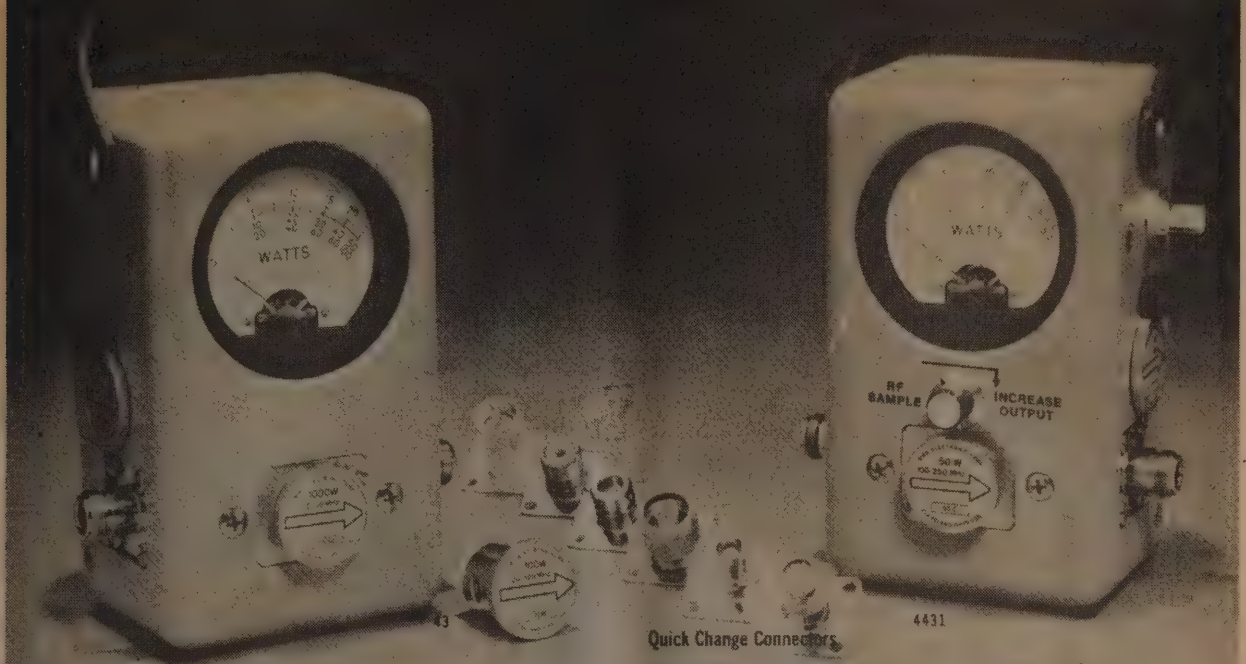
Regency Electronics
7707 Records St.
Indianapolis, Indiana 46226

REQUIRED REFERENCE

Regency Owner's Manual Model HR-440 440 Mhz Amateur FM Transceiver (supplied with rig; $5.00 otherwise)

ACKNOWLEDGEMENTS

The author is grateful to Metrovision Amateur Television Club for purchasing the HR-440 used to develop this modification procedure. Terry Fox, WB4JEJ, provided a valuable test equipment to optimize the modification design and Tom O'Hara, W60RG, provided useful comments concerning the MHW-710 power module. The video modulator printed circuit board was fabricated by Stu Mitchell, WA0DYJ/4.



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Read RF Watts Directly.

0.45-2300 MHz, 1-10,000 watts ±5%, Low Insertion VSWR—1.05.

Unequalled economy and flexibility: Buy only the element(s) covering your present frequency and power needs, add extra ranges later if your requirements expand.

Table 1 STANDARD ELEMENTS (CATALOG NUMBERS)

Power Range	Frequency Bands (MHz) 2-30	25-60	50-125	100-250	200-500	400-1000
5 watts		5A	5B	5C	5D	5E
10 watts	—	10A	10B	10C	10D	10E
25 watts	—	25A	25B	25C	25D	25E
50 watts	50H	50A	50B	50C	50D	50E
100 watts	100H	100A	100B	100C	100D	100E
250 watts	250H	250A	250B	250C	250D	250E
500 watts	500H	500A	500B	500C	500D	500E
1000 watts	1000H	1000A	1000B	1000C	1000D	1000E
2500 watts	2500H					
5000 watts	5000H					

Table 2 LOW-POWER ELEMENTS

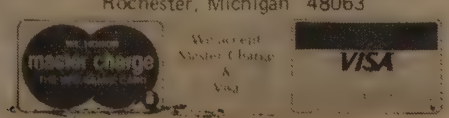
1 watt	Cat. No.	2.5 watts	Cat. No.
60-80 MHz	060-1	60-80 MHz	060-2
80-95 MHz	080-1	80-95 MHz	080-2
95-125 MHz	095-1	95-150 MHz	095-2
110-160 MHz	110-1	150-250 MHz	150-2
150-250 MHz	150-1	200-300 MHz	200-2
200-300 MHz	200-1	250-450 MHz	250-2
275-450 MHz	275-1	400-850 MHz	400-2
425-850 MHz	425-1	800-950 MHz	800-2
800-950 MHz	800-1		

Read RF Watts AND Sample RF Signals

The new THRULINE Wattmeter model 4431 offers all the power measurement functions and versatility of the model 43 (above). It also provides a variable RF signal sample for use with frequency counters, scopes, spectrum analyzers, etc. at the same time power tests are made.

The amplitude of the RF sample is adjustable between -15dB and -70dB by a control knob on the front of the wattmeter.

115 Bellarmine
Rochester, Michigan 48063



Read RF Watts AND Sample RF Signals (cont)

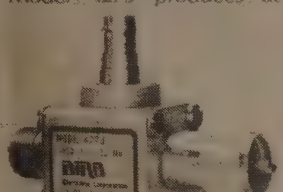
Max. Power Rating is 5000 watts (2-30 MHz) and 1000 watts (30-1000MHz). VSWR with RF samples -30dB or lower is 1.07. Model 4431 uses Table 1 and 2 Plug-in Elements.

QC-Quick Change Connectors avoid the use of performance degrading adaptors. Order spare QC Connectors for model 43, or 4431. These models are shipped with the N-Connector shown, unless ordered otherwise.

New: Variable RF Signal Sampler

For RF signal observation on a scope, for spectrum analysis, or for frequency counting and control.

Model 4275 produces at the BNC port an unrectified sample adjustable between 35dB to 80dB below main line signal. Usable range: 20 to 1000MHz up to 1000 watts.



Model 4273 for lower frequencies (1.5 to 35MHz) is adjustable between 40dB to 70dB below a main line maximum signal of 5000 watts.

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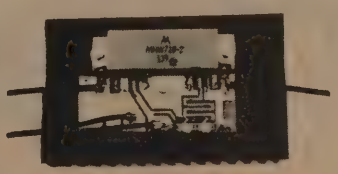

(Improved version from TVC-1 in Ch. 14 of ARRL Handbook)

1. TXA5-4 ATV EXCITER/MODULATOR ..... **$89 ppd**

This wired and tested module is designed to drive the Motorola MHW-710 module in the PA5 10 watt linear amp. The crystal in the 100 mHz region keeps harmonics out of two meters for talk back. The video modulator is full 8 mHz for computer graphics and color. Requires 13.8 vdc reg @ 70 ma. Tuned with xtal on 439.25, 434.0, or 426.25 mHz. Built in sync expander.

Two Frequency Exciter ..... **$115 ppd**

Set-up with D1010-N 90W amp ..... add $20 ppd

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Also available with the NE64535 (TVC-4L) ..... **$105 ppd**

Size: 5 1/4 X 2½ X 7 inches.

♦♦♦♦♦♦♦♦♦♦♦♦♦ Package Specials ♦♦♦♦♦♦♦♦♦♦♦♦♦

TXA5, PA5, FMA5, and TVC basic module package . . . . . (Reg. $262). . **$249 ppd**

OPTIONS: 2 frequency exciter . . . . . add **$26**
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Clubs & Groups...10% discount on 5 or more of one module ordered at one time to one address.

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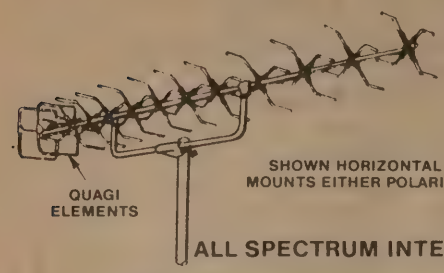

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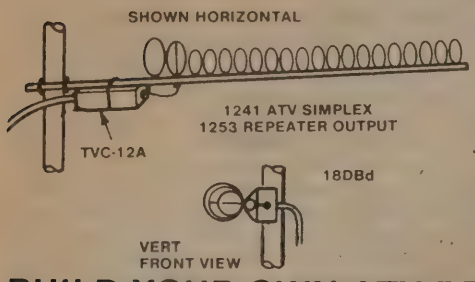

TVC-12a 1215 to 1300 mHz DOWNCONVERTER .... $89 ppd

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18 dbd gain and full bandwidth on a 7 ft boom. With N connector.

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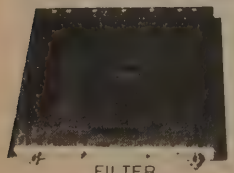
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PSF438-ATV INTERDIGITAL VESTIGIAL SIDEBAND FILTER ..... $132.45 ppd
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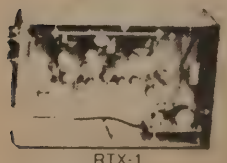
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TD-1 TONE DECODER. Detects horizontal sync to key xmtr..... **pc board $5.**

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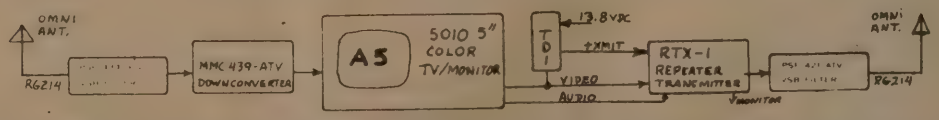
Contains sync equalized TXA5 exciter, FMA5 sound subcarrier, MHW710-2 10 watt power module, and DM-1 Detector/Monitor in a shielded diecast aluminum box.



SEE pg. 80 of "EVERYTHING YOU ALWAYS WANTED TO KNOW ABOUT AMATEUR TELEVISION" book for complete repeater info. Adding special effects, mixing two meters, getting rid of desense and interferance from other transmitters at the same site, etc.

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Channel 24

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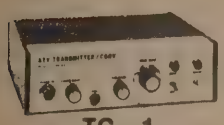

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- *High-resolution & color video
- *Regulated AC Supply Built In
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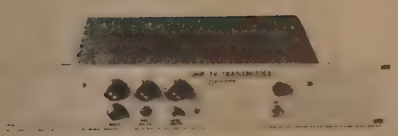
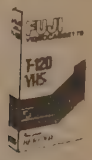
GP-41D

D1010





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TVX-1 TELEVISION TRANSMITTER $500ppd

This is a complete 10 watt UHF TV transmiter in a 3½" high 19" rack panel intended for community television outside the USA or ATV in USA. Takes baseband video and line level audio input from a TVRO, VCR or camera. Also a mic input for voice overs. 117vac 60 hz supply. Video monitor output. 4 to 6 week delivery depending on frequency. Standard atv freq 434, 439.25 & 426.25 avail.

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Channel 25

KB9FO is the former Publisher of A5 magazine and a long-time proponent of amateur television. In this article he proposes some new technology and new directions for our thinking.

Slow Scan With A Difference

BY HENRY B. RUH*, KB9FO

CQ • September 1982

Slow scan as we know it has been used for ten years or more on the amateur bands, but the method used to transmit the pictures hasn't changed. The analog world is quickly changing to digital, and our transmission methods will change also. Even if you have a digital scan converter such as a Robot 400 or Wraase 422, you still use analog methods of transmission. The question I raise is: Why convert analog to digital to analog to digital to analog when the digital form is so much easier to send? Well, part of the answer is FCC regulations, and part of the answer is here.

First, the FCC has only allowed slow scan TV transmissions as an analog signal, using a voltage-to-frequency converter to produce an audio tone which is directly related to the luminance of the signal of the video source—*i.e.*, an f.m. audio representation of the video waveform. If you transmit a section of black, you actually send around 1500 Hz audio; white is 2700 Hz audio, with various levels in between. Old hat you say? Keep this in mind as we change to digital later.

In the analog world, the TV signal is a continuously variable voltage level. This produces a continuously variable audio signal which directly mirrors the TV picture undulations. With the advent of digital scan converters, the TV signal has been digitized. What has happened is that the signal which had virtually infinite possibilities of discrete levels between TV black and TV white, has changed. The process uses a series of voltage comparators. As the incoming signal is compared with a series of discrete voltage steps in the converter, a digital signal is generated which now represents various discrete and exact levels.

Most systems use 16 levels between TV black and TV white. There are commercial and experimental systems which use as few as 2 levels, and some which use 128 levels. The difference in the number of gray levels is a matter of taste and use whereby more levels will result in a more faithful representation of the original analog signal. For amateur use 16 levels is good enough, being a compromise between picture quality and cost. The drawback is that you do have errors and a visible contouring in the picture. But let's deal with the digitized signal a little more.

Once the SSTV signal is in the digital form, you can do a lot with the data. A simple memory will store the picture. By varying the load and read times, you effect scan conversion, changing fast scan TV signals into slow scan "frames." With a big enough memory, commercial uses include converting one fast scan TV picture to another set of fast scan standards. This is used to translate TV pictures recorded in European or French systems, which use 50 fields and 625 or over 800 lines, to U.S. standards, which are 60 fields and 15,750 lines (actually 59.94 fields and 15,734 lines). This is how we can watch *Benny Hill* and other British programs.

Our systems, however, change this wonderful digital information back to analog for transmission. We are still tied to the wasteful f.m. audio signal which has discrete and exacting conversion of the audio to video and vice versa, even though the signal will now only have 16 specific audio tones to represent the 16 discrete steps generated by our digital scan converter (plus 1200 Hz for sync). We have eliminated all the in-between "tones," since there is no way at this time (after digitizing the signal) to generate a gray level between, say, numbers 6 and 7, since the original information has been lost in the digitizing process. We can make guesses and use fancy averaging systems to recreate more gray levels, but they are not representations of the original signal, since when you receive the 16-level picture, you do not know what the actual level that generated each level was, or how the signal was changing (rate of change or slope) at the time the sample was taken. This is called a **quantization error** and is found in all digital systems. The greater the number of levels, the smaller the quantization error. However, there is always an error, since we are converting an infinite number of possibilities into a discrete number of actuals.

Our analog signal actually occupied (at any one moment it was only at one specific point, but over time it will cover all points) a frequency of from 1200 Hz to 2700 Hz in our transmitter audio bandwidth, and you just add your carrier frequency to find where you are in the radio spectrum. Our digitized signal will now occupy one of 17 discrete frequencies, so there is a lot of room in between steps to insert other material.

In commercial TV we use these in-between spaces in the luminance information to insert the color signal in a clever scheme set up by the National Television Systems Committee way back in the early 1950s, which is why we call our fast scan system NTSC (also known as "Never The Same Color" by engineers who prefer the other systems which are called PAL and SECAM). But the real question is, do we really need to send all that information? The related question is, can we send more or can we send it faster?

Let's look at the digital signal as generated in the scan converter. If we decide to use 16 gray levels, we will have to set up voltage comparators which will provide 16 data bits. Each comparator will represent one step between TV black and TV white. As the incoming signal is cut into tiny packages by a clock circuit, separating the continuous signal into samples, each sample is tested by the 16 comparators. One of the comparators will decide that the sample is equal to or nearly equal to its level and produce an **ON** state. The 16 discrete comparators are added in a special circuit which reduces the 16 parallel bits into a 4-level binary number. This is because we can count to 16 (or 0 to 15) in binary using only four powers of 2 (i.e., 1111 equals 16 and 0000 equals 1).

In-between numbers are made with different binary numbers (i.e., 15 would be 1110). We could now simply transmit the binary **WORD** which represents our digitized sample, but we don't. The scan converter will take the binary word and store it, or use it to generate a new frequency in an audio generator. Here the binary word is converted back to an ana-

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log audio signal. Each binary word will generate a discrete audio tone, representing the 16 gray levels and sync. In the scan converter, sync is actually artificially generated, since there is no need to save the original sync information because it is always the same signal no matter what the video looks like. Keep this in mind when you build your TV decoder systems to watch pay TV. No matter what they do, the sync signal can always be regenerated, and thus the video restored. It is impossible to scramble a TV signal beyond recognition, since we know what the TV signal looks like, and all we have to do is tinker with the scrambled signal until we recreate what we know should be. But that's another story for another time.

Something new: If you go back and look at what happens inside the scan converter, you will find that we had the video signal reduced to 4 binary bits, or a 4-bit word. We could simply use these 4 bits to generate 4 audio tones. The only problem is a minor one: selecting 4 tones that do not produce any intermod products which would be one of the original tones (i.e., if you mix tone 1 and tone 2, they could not be allowed to produce tones 3 or 4). By detecting the 4 tones (a musical chord), you could send the 4 bits in a parallel data system. You probably would use 8 tones, since you would want to represent both 0 and 1 so as not to have a false tone appear from interference sources. But even with 8 tones, there is a savings over the 17 tones used in the analog system. Some folks would also find clever ways to use less tones by using "signature" or parity bits to eliminate false words.

But let's go back even further into the scan converter to the comparator. The basis on which the comparator works is that a specific voltage as set by a resistor divider network establishes 16 discrete voltages. As the incoming signal is sampled, each sample is compared to the reference 16 levels, and when the two are the same or nearly so, that one discrete comparator turns on. Each sample is put to 16 tests. The results then have to be changed to four "tests," which then are generated and transformed again into the audio analog signal. Wouldn't it be marvelous if there was only one comparator and only one data bit to send? *Well there is!*

The reference used for the multilevel scan converter is a discrete voltage for each level. But what we really need is a new reference to compare each sample. Then we would have only one data bit to send. The easiest way is simply to compare the first sample with the second sample, the second sample with the third, etc. Thus, each sample serves as the reference for the next sample, until we reach the end of the line of video. If we look at the TV signal, what we really need to transmit is the direction of the video from moment to moment (towards black or towards white) and how much. If we sample the video signal often enough, the changes from sample to sample can never be very large. The fastest and biggest changes are simultaneous.

Fig. 1– A typical video line.

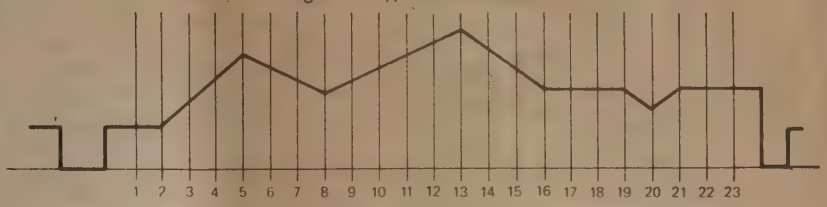

Fig. 2– For purposes of explanation, fig. 2 is a simplification of fig. 1.

If we have a picture which is black on the left side and white on the right side, we will send a series of samples that say there is no change, followed by a very large, quick change, followed by another series of no changes for the remainder of the white. A visual vertical grid of alternating black and white lines would be the worst case, since we would have to transmit a lot of changes, and all of these changes would be very large. But in real life, outside of test patterns, most of the TV pictures have a series of small changes between gray levels, or moderate changes from object to object. If our sample rate is fast, we can still represent these moderate changes, and with a little electronic trickery, we can even catch the big changes without too much delay. Since we are transmitting the differences between samples, or picture elements (we call these **pixels**, which stands for picture elements), let's call this **Delta Modulation**, delta being the greek letter we most often use to show a change when writing formulas and other scientific notation.

Let's look at a typical video line and how this would translate into delta modulation. Remember that all we can send is 0 and 1. Now in real life, we would have a very complex waveform as shown in fig. 1, and we would take a lot of samples per line, say 256 or 512. For discussion's sake, let's use a more easily understood waveform and less samples as in fig. 2. The principles are the same.

We see that the value of sample 1 is our start. Since it is close to black, we would send a 0. Sample 2 is a little more toward white, so we would send a 1. Sample 3 is a little more white than sample 2, so we would again send a 1. Sample 4 is a little more white than sample 3, so we would send another 1. Sample 5 is a little more white than sample 4, so we would send another 1. Sample 6 is a little less white than sample 5, so we would send a 0. And likewise for the entire line. Our transmission would be a series of 1's and 0's which would look like this:

01111000111110000100110

When there is no change, such as at sample 17 (18 compared to sample 16), we really don't have a way of saying *no change.* To compensate for this we simply send an alternating series of 010101. Since the largest change in a series of alternating 1's and 0's is only one level, if we use enough sensitivity (i.e., each change is only a very small amount), then the effect is very small. If the changes were very large, say from full white to full black at each 0/1 alternation, we would have a terrible picture.

If we say we are going to have 64 discrete levels in our final picture, then there could not be more than 1/64th change in brightness between samples. Therefore, a little fudging by alternating 1/0 to cover an area of equal brightness is not going to be easily noticed. However, there is a small drawback. The more levels you are going to have, the more samples it will take to get from full black to full white. Since we are only stepping one gray level at a time, it would take 64 samples to go from black to white. If we had only 64 samples per line, we would have a tough time drawing a checkerboard! We would end up with a single wavy line which would never get very far from the middle of the gray scale, depending on how many samples we had; if there are 8 samples per checker square, we would have a triangular wave with 8 gray levels (of our 64) from edge to edge, and back again, something like fig. 3.

While the desired picture is that shown for the input, our average output would look like the middle line. The actual signal would consist of 8 tiny steps up and 8 down as shown in the bottom line. However, because the pixels are small and we would view the picture from a distance, we would not perceive this aspect of the system, as our eye would simply blend the points together. Also, in a simple interlace scanning system the alternate lines on the display would be slightly offset and would provide an intermediate

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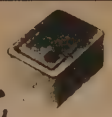

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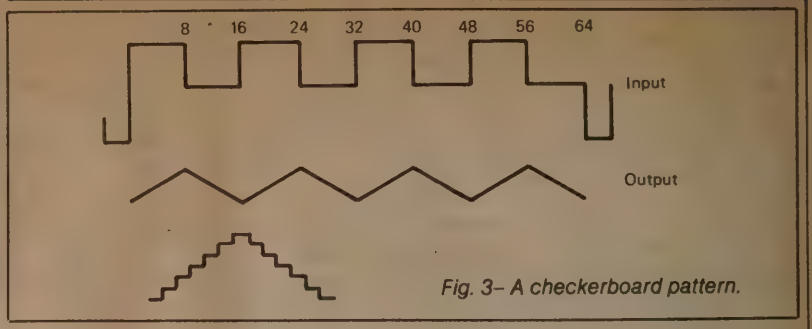


Fig. 3– A checkerboard pattern.

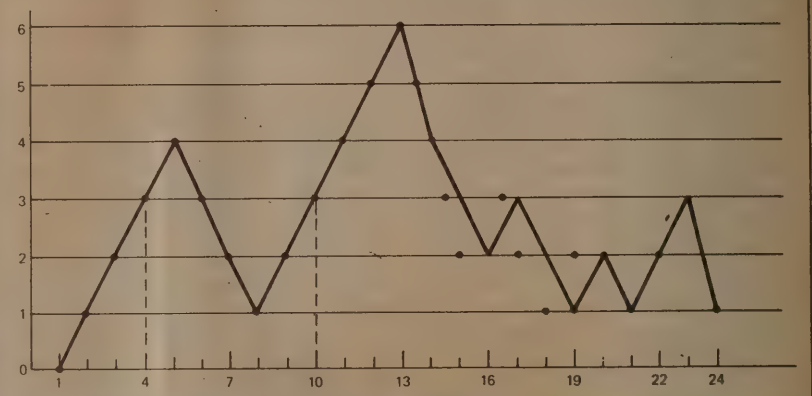


Fig. 4– A simple data train showing various samples with respect to gray levels. Details are explained in the text.

level as the two adjacent lines are visually merged, giving a smooth appearance. While this might be acceptable for a low-contrast picture, it is obvious that it adds a severe distortion to our checkerboard.

We could take more samples, say divide each of the 64 samples into 64 smaller samples (64 × 64), but this would create a very high data rate. We could also reduce the number of steps, say from 64 to 16, or 8, or 2. Each would provide a better and better reproduction of the desired picture. Since the checkerboard only has two gray levels, we could use a two-level video switch and we would have perfect replication of the gray levels. But when we change to another scene, with more information at more gray levels, we would have to change back to smaller steps. Now how can we do that?

If we examine the data train from our first example, you will notice that we have no difficulty following a gradual change. Samples 1, 2, 3, 4, 5, 6, through 15 would faithfully reproduce the waveform when reconverted from zeros and ones to the waveform. But what happens at sample 20? Depending on whether the flat area ahead of the 20th sample ends in a zero or a one, we either have a continued sawtooth, or a bump or bigger valley. What we need is a way of determining if the data series is actually following the data, or trying to catch up with the line. Let's look at a simple problem using the same line and give values to the various gray levels. We'll use 7 levels for simplicity.

Sample one is level 0.
Sample two is level 1.
Sample three is level 2.
Sample four is level 3.
Sample five is level 4.
Sample six is level 3, etc.

It changes our 0s and 1s as shown in fig. 4.

If we compare our generated waveform with the original waveform, we find that for the most part it follows rather well. When we get to the smaller details, the reconstructed waveform begins to depart from the original because of the quantization errors. From this we can see that the sample rate must be larger than the waveform to be reproduced. In commercial scan conversion and frame store units, a sample rate of three times the color subcarrier is used, as this is the minimum *Nyquist sample rate* required to reproduce the cyclical waveform. Because of the large number of samples and high frequency rates used in fast scan TV, a sample rate of four times the subcarrier frequency also works well. A sample rate that is much higher than the frequency of the detail is unnecessary, as you are only generating unnecessary bits and using a lot more hardware.

From all of this we can rationalize that the sample rate will be about three times the highest frequency we intend to reproduce. Thus, if we want to reproduce 64 bits per line, we need a sample rate that is 64 × 3, or 192 bits or samples per line.

However, we can cheat a bit with a little simple math.

For large changes we need either a very fast sample rate or large changes in reproduced level (larger steps). If we use large steps we end up with a severe contour artifact, since there are not enough intermediate levels of gray to produce a pleasing picture. Here is where our trick math system comes into play.

If you look back at the binary numbers that represented the delta or change in video level, you will notice that there is a basic pattern. As the change increases, the number of 1's increases, or the number of serial 0's increases. We can add a code recognition circuit which will count the number of series 1's or 0's. If there are three 1's or three 0's in a row, the counting circuit can say, "There is a large change here." We can now use our earlier binary system to do a little work.

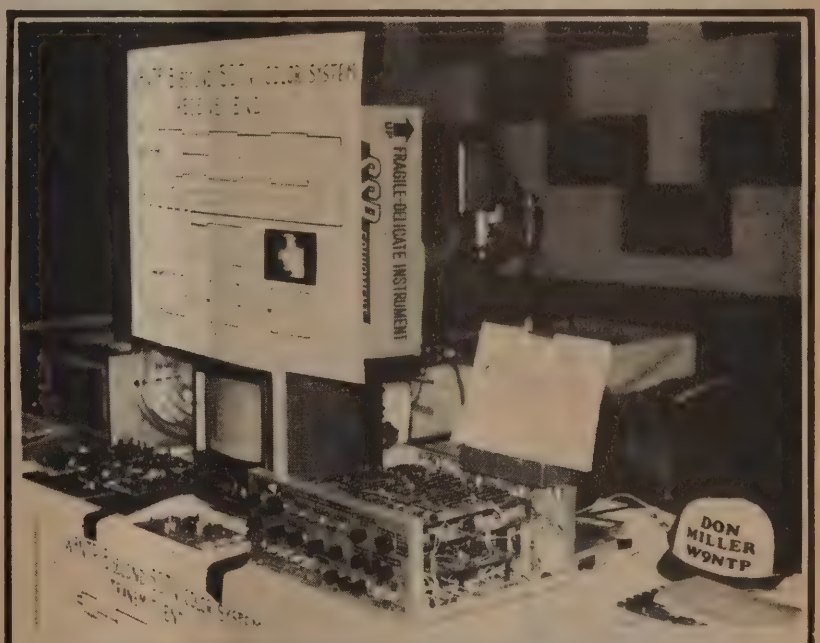
If the change is large, there is going to be a series of the same numbers. If the number series is constantly trying to keep up, saying more more more in the same direction, we can accomplish the same change by using a new counting system—binary. Let's call this **Delta Delta**, since it represents a change in the rate of change—DD for short. When the incoming data says 111 or 000, the "rate" finder will say double the rate. Now we are taking twice the amount of gray-level change for each successive 1. Four 1's would give us a 6 level change. If we had another series of three 1's, we would double the gray-scale change again, or 4 levels for each 1. The same is true for going in the other direction with a series of 0's. Now we can accommodate large changes in gray level at a faster rate of change without increasing our data rate.

Our sample rate has not changed, so our amount of data to be transmitted has stayed the same. What *has* changed is the amount of change the data represents. If the series of numbers is alternating, then we know we are at or near the right level, since we know that alternating 1's and 0's are moving our representation only up and down by one gray level. We can now look again at a series of three incoming data bits and say that whenever the data bits alternate 010 or 101, we can ignore the changes and generate a flat area in the waveform. It would take a 001 or 110 to move up or down one level. The numbers are not alternating, and they are not a series of three of the same number.

With a little math trickery, we can now represent the waveform a little better with no increase in data. A 000 or 111 means a great change (double the rate of change), 001 or 110 means move up or down one, and 010 or 101 means stay the same. We can now use these three "words" to control the reproduction with more precision than our original 1 equals up and 0 equals down.

The last consideration is where do we start. The first data sample for a video line has no relationship to the last data sample from the previous line—not if we use the same scanning system we are used to. The usual scanning form is to start at the left side of the picture, go to the right, return to the left, and start over again. But in a digital world we have no need for this. It is much more likely that the adjacent lines in a picture are related vertically, rather than horizontally from end to end, since they are adjacent picture elements, not elements at opposite ends of the scan line. So why not reverse the scan line? Line one is scanned right as we normally do; line two is scanned left in the opposite direction. We can now use our same comparator to look at the last bit (the far right) of line one and the first bit (at the far right) of line two. We now maintain our same comparison for an entire frame; each pixel is compared to the previous pixel.

At the start of a frame we have no real idea of where to start. The first pixel of the first line is not related to the previous frame unless we are sending still pictures. However, the purpose of reducing the amount of data required to send one picture is to be able to send the pictures faster, which affords motion! Now in any analog video display, such as your CRT,



Don Miller W9NTP; Waldron, Indiana at Dayton 82 with 8 second color SSTV

Walter Giesser WB20WX at KW Control Systems R&D Dept. N.Y.

there is a bit of time required to move the scanning electron beam back to the top of the picture. We eliminate the horizontal "flyback" or blanking time by using a simple reverse scan system. Now the time to go from left to right is the same as it is to go from right to left. If we try this at the vertical rate, we have a bad visual flicker because of the decay of the display produced at the top of the picture between the time we started and the time we got back. If we reverse scan vertically, we double the amount of time between scans over the same spot at the top of the screen.

We can put this time to good use. After we send a *"go to the top and start over again"* sync pulse (vertical sync), we can send a little data. In fast scan TV we already do this. After the vertical sync pulses, but before the start of the active picture, we insert all sorts of information. This information is in the form of various test signals such as **VIR** (Vertical Interval Reference), **VITS** (Vertical Interval Test Signals), and lately, closed captioning, which prints out the text at the bottom of the screen for hearing-impaired viewers.

We can also insert some intelligence into the same time period. We will send a *"look ahead"* or *"peek"* at the first bit of digital video. What we need is a simple binary word which tells us where to start. If we continue the same 16 gray levels used in analog slow scan, we need only a 4-bit binary word to tell us from what level to start counting. If we need more gray levels, we simply use a bigger *"peek"* word. If we make an arbitrary start, we might be right or dead wrong. If we always start from video black, and the real picture is video white, we will be completely wrong, and vice versa. It will take as many data bits as gray level error to catch up to the first pixel, and by then we will be partway across the screen and always behind until the video and data cross or meet somewhere towards the middle. If we always start at the middle gray level, we will be starting closer, but only once in a while will it be right. So let's use the *"peek"* system to get started at the right point.

So there you have it: a way to send SSTV with a faster frame rate, less spectrum, since we are only sending one data bit per pixel, and our replica will be close to the original. To summarize, let's pick a few numbers and start experimenting. Let's continue to use 16 gray levels. This will keep our data sample rate within reason. We need only 5 bits to go from full black to full white. We will use a series "detector" to keep track of the data trend, looking for 111, 000, 100, 001, 110, 011, 010, and 101. We will use reverse scanning on alternate lines so there is a better chance of having a small error or no error on the first bit of each line. Let's use 64 or 128 pixels per line to further keep with current SSTV standards before we settle on "optimized" rates, and let's use RTTY shift keying (FSK or AFSK) so we can use existing hardware to detect the two signal states (0 and 1) and stay within current bandwidths.

Since this new system is not listed in the FCC annals, we will have to get some STA's to use it on the air. However, we can work on it "closed circuit" or with intermediate conversion to ASCII or such on the air. With higher data rates such as that used for Packet radio, it should be possible to have motion at rates of 2 or 4 frames per second within voice bandwidth, and perhaps as high as 8 frames per second using the medium scan bandwidth as used by Don Miller, W9NTP, and others working in this same arena.

I hope this gets your thought processes working!

Color SSTV Operator Charlie Chaney KA6CDK, Rowland Hts., CA

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Tom Hibben KB9MC

KB9MC A5 "SSTV'er OF THE YEAR 1982!

Congratulations to Tom Hibben KB9MC of Desoto, Wisconsin awarded A5 Magazine's "SSTV'er of the Year" for 1982! Tom has been "active" on SSTV for a number of years, operates both black/white and color picture modes and has developed what is today called "Motion SSTV" with his highly modified 6-memory Robot 400 SSTV Converter. The "motion" effect is similar to flipping hand made cartoons on the pages of a book (only electronically) with some pretty neat special effects. Tom has demonstrated this unique addition to the popular video mode at Dayton, Cedar Rapids and most recently at the FSTV Midwest Conference in Peoria, Illinois as well as other hamfests. The one thing that really stands out about Tom and his SSTV manner is that he seems to get along well with everyone. He is probably the most up-to date SSTV'er on all the modifications that are available for the Robot 400 Converter, many of which he developed on his own. Tom has been very helpful obtaining some of these "hard to get" modifications that seem to go only to those "paying customers" of converted systems for reader's of A5. We salute KB9MC for keeping the communications door open in a time when so many seem to be trying to keep it shut! Tom Hibben's love for "video" is already expanding as he is beginning to look into the possibilities of even higher resolution with FSTV in Wisconsin. A5 ATV MAGAZINE "congratulates" Tom Hibben KB9MC as this year's SSTV'er of the Year 82!

A5 SHACK OF THE MONTH

I3XQW

SSTV "ITALIAN STYLE"

This month's beautiful color front cover pictures were taken by Piero Mescalchin I3XQW of Padova, Italy and were part of a fantastic article on Color SSTV in the National Italian "RADIORIVISTA" Magazine March 82 issue. All photos were taken off a Wraase SC-422A Scan Converter.

PIERO MESCALCHIN
VIA MONTI, 1
35100 PADOVA - ITALIA

8 AND 12 SECOND SINGLE-FRAME COLOR SSTV

By Robert Suding W0LMD

Black and White SSTV pictures take 8 seconds to transmit. So why not transmit color SSTV pictures in the same amount of time?

Well, there is more to transmit, right? Well, maybe. Suppose we stand back a bit to see the whole picture, so to speak. The major intention is not to send an absolutely perfect picture, especially on 20, but rather to convey as much video information in as little time and bandwidth as possible.

The bulk of SSTV stations are now using 128 Horizontal x 128 Vertical (16384) picture elements (pels) digitized to 4 bits (16 shades) resolution. The signal goes through two ham rigs and maybe a pair of tape recorders, each taking 8 seconds and not having much more than 2500 Hz bandwidth. Since the B & W picture lacks color rendition, superior sharpness should be substituted to make up for the lack of color. 128 pel x 16 shades on a horizontal line does not overtax the SSTV system when band conditions are perfect. Since 1973, experiences with the W0LMD and W6MXV Camera Scan Converters, which have about 200 pel x 16 shades (later versions 32 shades) have produced B & W pictures considerably superior to the 128 pel transmissions usually seen today.

Assuming we did have enough bandwidth for 200 pel (which isn't quite true), if we take this 200 pel and compress it to be equivalent in time to the 128 pel to derive the same definition, this comes out to .64 of the time. In other words, we should be able to squeeze the SSTV lines by a factor of .64, and get an SSTV line time of 42.9ms instead of the 60 Hz. time of 67 ms. Now, the remaining 24.1 ms is free for use on something else. Color maybe?

Since the Green color is the most important, (it carries the most facial detail, and provides the best detail for B & W compatibility) transmit the Green during the front 2/3 of the line. Transmit the other 2 colors in the remaining 1/3 line, maybe 1/6 Red and 1/6 Blue, or maybe a bit more time for the Red, and a little less for the Blue (it is the least important. However, squeezing 128 pel of Red and 128 pel of Blue into 24 ms is a bit too tight. I tried a suggestion from W9NTP and put Red on odd lines, and Blue on even lines. The result is that the transmitter sends odd lines which are 2/3 Green and 1/3 Red and even lines which are 2/3 Green and 1/3 Blue. To keep things, straight, I start each odd line with Horizontal sync, send the odd line Green video send a Red header, and then the Red video data (See Aug. 82 A5 for details on "headers.") The even lines are similar, only send a Horizontal sync pulse, the even line Green video data, a blue header, and finally the Blue video data.

This results in 128 Green lines, 64 Red lines and 64 Blue lines. The Red video is sent to both the odd and the even line below the one currently being received, and the Blue video is sent to the even line and the odd line above. Just to keep the definition as high as possible, I load and unload the picture from 128 pel on all 3 colors, but the Horizontal bandwidth of the Red and Blue is somewhat restricted by trying to squeeze 128 pel in and out of 24 ms. This sounds like a rather coarse picture, but W9NTP et al. have long suggested not even sending the Blue at all. Reduction of the Red is a bit more serious, but the higher resolution of the dominant Green should compensate for the lower resolution of the Red and Blue. In theory, anyway.

On July 29, 1982, I tried the first on the air tests of 8 second Single Frame Color (8SFC). Several amateurs on 20 and 75 SSTV viewed my signal on 128 x 128 x 16 shades scan converters and P7 monitors, and made tape recordings which they retransmitted back to me. The microprocessor controlled W0LMD Scan Converter II was reprogrammed to correctly receive the 8SFC, and display the results.

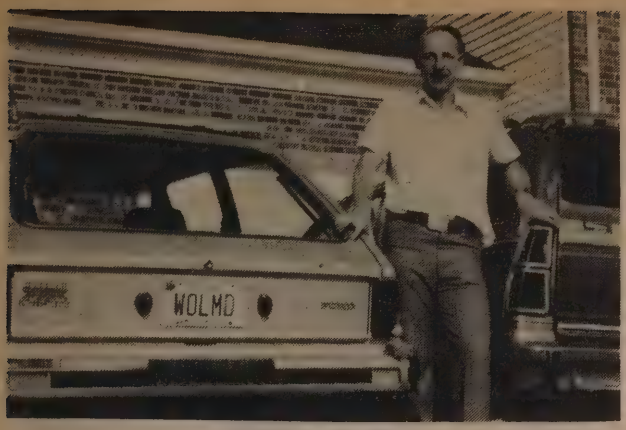
So how did it look? Lousy resolution! It did not have the sharp resolution that I generally desire. The edges of the images were smoothed out, and in general was about the same as the countless 128 x 128 x 16 shades SSTV pictures which are transmitted today. Except for one thing — THE PICTURES WERE IN COLOR — IN 8 SECONDS EACH, ONE AFTER ANOTHER! A picture showing a red bird and a green bird came back showing a red bird and a green bird. In 8 seconds! No fiddling with switches. Color frame after color frame in 8 seconds. Pretty girl" pictures came back with luscious red lips, blond hair, expressive eye colors and shadings. In 8 seconds apiece. Fabulous!

One interesting thing occurred. AB3J captured one of the "pretty girl" pictures on his B&W Robot 400 system, and sent it back. Amazingly, my scan converter reproduced a color picture. It was seriously degraded in resolution, but the 8SFC system is evidently so B&W compatible, that it can even retransmit from B&W back to color.

I next tried to lengthen the SSTV line time to 100 ms from the normal 67 ms of B&W SSTV and 8SFC. The Green portion was made 55 ms long (same size as 50 Hz stations now use) and the Red/Blue portions were made 35 ms long. The neat part about 12 SFC is that 100 ms isthe reciprical of 50 Hz times 5 and the reciprical of 60 Hz times 6. Therefore, both USA and European, etc. countries can bethe same without hum bar problems. The resolution is B&W quality and since the dominant Green is allocated the same amount of time as the B and W video would have been given, plus we have the Red and Blue Video. The resolution is not as good as 25SFC, but it produces twice as many pictures as 25SFC, which is much more important.

The proposed 25SFC system described in August 82 A5 was slightly modified to make it identical in the sync times to 8SFC and 12SFC. The result was a reduction of the sync and header times to 5 ms each instead of the original 6 ms suggested. The various B&W and Color SFC systems are diagrammed at the end of this article.

The possible future strategy of SSTV began to occur to me. There is a range of pictures which amateurs send to each other (a large bulk of which are a waste of time!) Most pictures are "mood" or "snapshot" pictures. These are the "pretty girl",



W0LMD Robert Suding

"Snoopy", "neat car" etc. pictures. Let's call them class 1. These are the majority of the pictures sent today. High resolution is not too important, but the lack of color is detrimental to what we have all come to expect on commercial TV.

Class 2 might include the self portrait of the ham sending the pictures, or of his xyl and/or kids. "Dog and Pony" shows for non SSTV hams and non hams also fit this class. In class 2, resolution is more important, as is color, because the viewer should have the ability to easily recognize the picture, or the ham at a convention when they meet. Timeliness to maintain the mood is less important. 25SFC would produce an excellent picture, but it really does take too long. Any possible mood which can be set by zooming in gets lost over the 25 seconds that each picture takes.

Very high resolution class 3 pictures should be 256 x 256 x 64 shades B & W. Since only 1/4 more memory is required for a 256 x 256 B & W picture than 3 color planes, the scan converter of the future should include the ability to reorganize memory structures to accomodate to all classes of pictures. The 256 x 256 x 64 shades picture requires 17 seconds to transmit. Detailed pictures of the ham-shack, pictures of the new rig/scan converter/etc., or a shcematic are appropriate things to use 256 x 256 x 64 shades on.

Possibly the compatibility of 12SFC to USA and European stations will provide a convenient common exchange medium.

Obviously, a number of present modes have been unmentioned. Multiframe color completely destroys the continuity of the information exchange due to the clumbsiness of its operation and should be abandoned by all exc ept for occasional experimentation. 128 x 128 x 16 shades and P7 monitors for B & W will remain as the "standard", but newer systems should move towards greater resolution B & W at least 256 Horizontal pel by 128 lines, more shades of grey - 64 shades now, 16 bits of color instead of 12 bits which is noticeably contoured, as well as more memory for storing multiple pictures. This sounds like a large amount of memory, but the W0LMD Scan Converter II only has 16 of the 64K memory chips, but will store 4 color pictures at once with 16 bits of color information. While the system is complicated, the cost is $100 less than a B & W Robot 400.

SSTV FORMATS

If SSTV transmissions were sent so that the beginning of a frame wuld give the receiving station enough information about which format to expect, then the transmitting station could intermix the formats, and the receiving station would automatically switch from B & W to color, or 8 second SFC to 25 second SFC, etc.

The information should be available as soon as possible in the frame. The vertical sync pulse length is a natural market on the line length if you make the duration of the Vertical sync equal to the Horizontal line length. The system then knows that a 200 ms long V sync pulse equals a 25 second transmission. However, the duration of the frame is not necessarily known, since an 8 second B & W frame has the same sync pulse duration as the 16 second B & W frame. Additionally, the various frames of multiframe color have an identical line duration time, but they must be loaded to different memories. These problems are solved by putting an encoded grey scale on the next line. An intelligent scan converter of the future can then inspect the top two lines of the frame and know everything about the upcoming picture.

Many systems already place grey scale patterns on the bottom of the frame. However, the proper place for automatic SSTV selection is the top, so either the grey scale should be moved to the top, or the grey scale should be split. Since most TV monitors tend to overscan at the top and bottom, it is better to split the grey scale and put half at the top and half at the bottom. The important video information at the top or bottom is then no longer lost through overscan by the monitor. The actual number of lines in the SSTV frame can be variable. You will notice that I have made all of the systems have an even number of video lines. Then with the vertical sync pulse line the total count will come out to an odd number of lines. The video lines were made an even number because of the 8 and 12 second SFC system's need for a pair of lines to define the 3 colors.

The grey scale for B & W can be graduated from white to black for one resolution, and from black to white for the other. The SFC systems can do the same thing, although presently the SFC frames are all 128 lines long. However, the future may desire 256 color lines, so the reverse coding scheme should be utilized as in B & W. Multiframe color should place a binary coded header as the first video line. This can follow the suggested system by VE3EGO in May '82 A5, p. 28. I have some doubt why anyone would want automatic multiframe, but just in case...The following systems are being programmed into my new scan converter.

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8 Second Single Frame Color

```
Line <---------------V sync --66.67 ms------------------->
   1 <--->(-Green grey-W to B--------)<->(-Red grey-W to B)
   2 <--->(-Green grey-W to B--------)<->(-Blue gry-W to B)
   3 <--->(-Green grey-W to B--------)<->(-Red grey-W to B)
   4 <--->(-Green grey-W to B--------)<->(-Blue gry-W to B)
   5 <--->(-----Green Video----------)<->(----Red Video--->
   6 <--->(-----Green Video----------)<->(---Blue video--->
   7 <--->(-----Green Video----------)<->(----Red Video--->
   8 <--->(-----Green Video----------)<->(---Blue video--->
     .
     .
     .
     .
 123 <--->(-----Green Video----------)<->(----Red Video--->
 124 <--->(-----Green Video----------)<->(---Blue Video--->
 125 <--->(-Green grey-W to B--------)<->(-Red grey-W to B)
 126 <--->(-Green grey-W to B--------)<->(-Blue gry-W to B)
 127 <--->(-Green grey-W to B--------)<->(-Red grey-W to B)
 128 <--->(-Green grey-W to B--------)<->(-Blue gry-W to B)
       !              !                !          !
odd  H sync          Green          Red Hdr     Red
even H sync          Green          Blue Hdr    Blue
     5 ms            34 ms      1.6ms,1.6ms,1.6ms  22.67 ms
```

12 Second Single Frame Color

```
Line <---------------V sync --100 ms--------------------->
   1 <--->(-Green grey-W to B--------)<->(-Red grey-W to B)
   2 <--->(-Green grey-W to B--------)<->(-Blue gry-W to B)
   3 <--->(-Green grey-W to B--------)<->(-Red grey-W to B)
   4 <--->(-Green grey-W to B--------)<->(-Blue gry-W to B)
   5 <--->(-----Green Video----------)<->(----Red Video--->
   6 <--->(-----Green Video----------)<->(---Blue Video--->
   7 <--->(-----Green Video----------)<->(----Red Video--->
   8 <--->(-----Green Video----------)<->(---Blue Video--->
     .
     .
     .
     .
 123 <--->(-----Green Video----------)<->(----Red Video--->
 124 <--->(-----Green Video----------)<->(---Blue Video--->
 125 <--->(-Green grey-W to B--------)<->(-Red grey-W to B)
 126 <--->(-Green grey-W to B--------)<->(-Blue gry-W to B)
 127 <--->(-Green grey-W to B--------)<->(-Red grey-W to B)
 128 <--->(-Green grey-W to B--------)<->(-Blue gry-W to B)
       !              !                !          !
odd  H sync          Green          Red Hdr     Red
even H sync          Green          Blue Hdr    Blue
     5 ms            60 ms      1.6ms,1.6ms,1.6ms  30 ms
```


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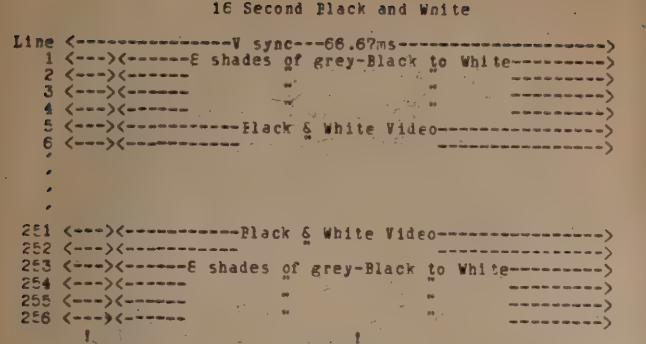
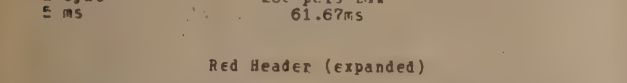
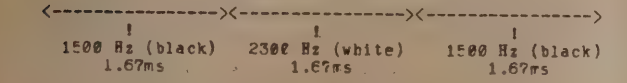
16 Second Black and White



Red Header (expanded)

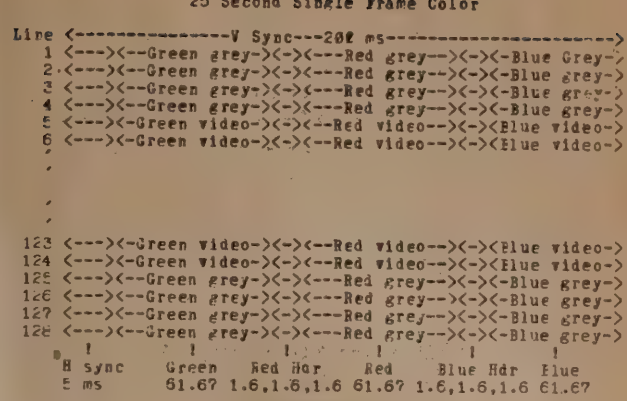


Blue Header (expanded)

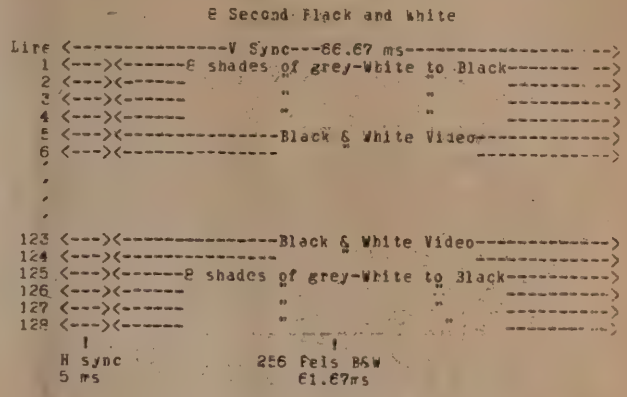


73,
Dr. Robert Suding W0LMD
1161 Reston Ave
Herndon, Virginia 22070

25 Second Single Frame Color



8 Second Black and White



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GETTING STARTED IN SLOW SCAN TV

Introduction. Slow scan television (SSTV) is an exciting medium for amateur radio operators. Whether you are an inactive ham who has lost interest or an active amateur looking for new challenges, SSTV with Microcraft's VIDEOSCAN 1000 is the answer. If you can operate a home TV camera and adjust a TV monitor you have the necessary skills to operate SSTV on the amateur radio bands.

Presented below are generalized answers to questions often asked by people not involved in slow scan TV. Hopefully this information will help you decide if you want to get into this wonderful world of amateur slow scan television.

What is the difference between "regular TV" and SSTV? The bandwidth required for regular TV (sometimes called fast scan TV or FSTV) is about 4.5 MHz. This bandwidth is more than all the combined h.f. bands available to U.S. amateurs! So from a technical point of view FSTV on these bands is not practical for amateurs.

SSTV, however, uses only a 3 KHz bandwidth which permits transmission of pictures over voice grade radio channels. This narrow bandwidth will not allow the transmission of motion. However, good quality "still" pictures can be transmitted in reasonably short periods. Transmission times vary from 8 seconds, for amateur-standard low resolution pictures, to 34 seconds for high resolution pictures.

Are special receivers and transmitters needed for SSTV? Definitely not! You can use your regular ham station SSB receiver and transmitter (or transceiver) to operate SSTV.

The SSTV signal from VIDEOSCAN is fed directly to the microphone input of your transmitter. For reception the SSTV signals are coupled from the audio output of your receiver. SSTV gear like VIDEOSCAN can be regarded as an add-on to your existing station, like RTTY gear. VIDEOSCAN has all the necessary jacks and switches for complete station operation. You just add a few cables, a TV camera and TV monitor.

Who can operate SSTV? Any general, advanced or extra class amateur can operate SSTV. SSTV operation is restricted to the phone portion of the bands. Generally speaking a licensed U.S. ham can operate SSTV on the same frequencies he uses for phone.

Is there much SSTV activity? There are over 15,000 SSTV stations in over 100 countries around the world. Imagine receiving pictures from England, Germany, New Zealand, Italy, Canada, Mexico, South America, Japan or Africa. DXCC on slow scan is a worthy goal and has already been achieved by several amateurs.

What kind of pictures are seen on SSTV? Pictures vary considerably depending on the personality of the operator. Pictures of the operator and the ham shack probably top the list. Other SSTVers specialize in cartoon subjects, family photos or vacation pictures.

Pictures of the planets from U.S. spacecraft are transmitted regularly by N6V a specially licensed station at the Jet Propulsion Labs in California. These pictures are of historic value and are usually transmitted only minutes after being received on Earth.

Are there any SSTV nets? The most popular net is the Saturday afternoon SSTV network that meets at 1800 GMT on 14.230 MHz. Call-ins with or without SSTV gear are welcome. Slow scanners are a friendly group and are happy to answer your questions about SSTV. General class amateurs may now operate SSTV on the 20 meter band. Activity can usually be found around 14.285 MHz.

What is a scan converter? A scan converter is a device to convert FSTV signals to SSTV and vice-versa. VIDEOSCAN is a high resolution scan converter.

A scan converter provides several useful functions. Included is a digital memory used to store one or more SSTV pictures. These SSTV pictures can be displayed on an ordinary FSTV monitor. The scan converter also allows a regular FSTV camera to be used to grab pictures into memory.

What is high resolution SSTV? SSTV has evolved as a low resolution medium of communication because of the technology required. First generation scan converters were capable of storing only 128 line pictures of 128 pixels per line with each picture element (pixel) quantized to 16 levels of gray. VIDEOSCAN is completely compatible with amateur-standard SSTV and first generation units. However, VIDEOSCAN produces much higher quality pictures because it utilizes 256 pixels per line and quantizes each pixel to 64 gray levels.

In addition VIDEOSCAN has two high resolution modes of 17 and 34 seconds which permit transmission of true 256 line pictures. This resolution rivals commercial TV quality and is extensively used for industrial applications.

Can I record my SSTV pictures? Definitely yes! A tape recorder is a basic tool for slow scanners. Since SSTV is an audio medium the signals can be recorded with an audio tape recorder. A recorder and tape that provide the smoothest tape movement is recommended.

You can tape a short program of your ham station or any other interesting program. Once you have composed your program on tape, you can play it back over and over again on the air. Some operators put CQ calls on tape so they do not have to set up the camera. And do not forget that you can record the other fellow's slow scan too. This allows you to make an excellent historic record.

What about color SSTV? Color SSTV, although an exciting prospect, is very experimental and expensive. Only a relatively few amateurs have experimented with it using modified or home brew gear. One of the main problems is that there are currently no standards for color transmissions. Other problems involve high cost of equipment and greatly extended transmission times needed.

How much power can I run on SSTV? Standard amateur radio rules govern SSTV transmissions. SSTV like RTTY is a 100% duty cycle transmission. Therefore, you should check your transmitter's rating to see how much power it can handle in this mode. Continuous ratings are usually much less than SSB ratings. You may have to adjust the level control of your transmitter to avoid overdriving it on SSTV.

Can I use VIDEOSCAN on my telephone line? SSTV can be transmitted on the telephone to anyone in the world with SSTV equipment. You will need a phone patch or other interface equipment available from phone company to isolate and monitor power levels on the phone line. With this setup you can have your own private picture telephone.

Should I buy my VIDEOSCAN as a kit or a wired? VIDEOSCAN is a complex piece of electronic equipment and requires good workmanship and attention to detail. The kit is recommended for only the advanced builder who needs minimum instructions and has considerable experience in soldering and constructing modern integrated circuit equipment. A complete manual accompanies all units.

★ ★ HIGH RESOLUTION SSTV ★ ★

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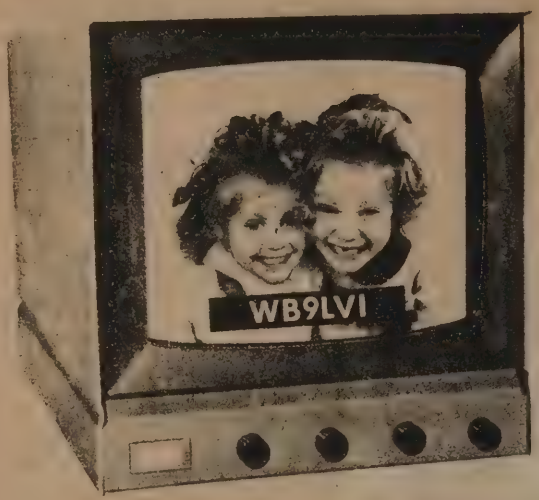

MICROCRAFT'S NEW VIDEOSCAN 1000

Converts SSTV signals into clear, sharp, high definition pictures on your TV monitor. If you can operate a TV camera and adjust a TV monitor you have the necessary skills to operate SSTV on the amateur radio bands or on phone line TV.

.....CHECK ALL THESE FEATURES.....

* *Compatible with amateur-standard SSTV and first generation equipment.*
* *In addition to amateur-standard modes, VIDEOSCAN has two hi-resolution modes.*
* *High resolution picture modes produce picture of 256 lines x 256 pixels per line. Four times better than earlier models.*
* *Pixels are quantized to sixty-four levels of gray. Four times better than earlier units. No contouring or false edges to detract from picture.*
* *Three separate scan rates for optimum versatility under all conditions.*
* *Split screen mode enables viewing four regular SSTV pictures at one time.*
* *Transmit cursor appears on screen showing current line being scanned.*
* *Built-in gray scale pattern aids in setting controls.*
* *Optional call sign available at flick of switch.*
* *Single frame of video may be grabbed into memory from TV camera or other video source thus stopping motion.*
* *All necessary switching between transmitter, microphone and tape recorder is included. Just add a few cables, a TV camera and a CCTV monitor.*
* *Can be used for phone line TV with simple adapter. You can have your own private picture phone.*
* *All solid state with socketed LSI integrated circuit for low power and light weight.*
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In case you are new to SSTV, here is a brief description of how it works. Using an ordinary TV camera, a picture is grabbed into the scan converter memory. A microprocessor examines each of the picture elements (called pixels) and converts them to audio tones. The resulting audio signal has the same frequency range as the human voice and can be transmitted over a telephone line or SSB transmitter.

At the receiver, the tones are converted back into pixels and put into memory. The memory produces a regular TV signal for viewing with a TV monitor. Low resolution amateur-standard SSTV requires eight (8) seconds to complete a transmission. High resolution SSTV transmissions require seventeen (17) or thirty-four (34) seconds.

PHONE LINE TV

You can use *VIDEOSCAN* on your telephone line with a simple adapter available from your telephone company. The adapter is necessary to provide isolation of the equipment from the phone line and to control the power level. SSTV can be transmitted on the telephone to anyone in the world with SSTV equipment. With this arrangement you can provide remote surveilance or have your own private picture telephone.

Rear Panel View Of VIDEOSCAN 1000

SPECIFICATIONS

Memory Capacity: 256 lines x 256 pixels with 64 levels of gray.
Scans Available: 8 seconds (amateur-standard), 17 and 34 seconds (high resolution).
Modes: Regular full screen and quad-split screen.
SSTV Inputs: RCA jacks, 50 mv RMS minimum, 10k ohm.
Video Input: BNC jack, standard composite video, 1.0 v. minimum, negative sync.
Tape Output: Switch selectable from memory, receiver tape, or other.
Mike Input: Standard 3-wire phone jack, isolated from chassis.
Transmitter Output: Standard 3-wire phone jack, isolated from chassis.
TV Monitor Output: UHF jack, composite video, negative sync.
Power Requirements: 117 VAC, 50/60 Hz. (230 VAC optional at extra cost).
Dimensions: 10½ inches wide x 11¾ inches deep x 4¾ inches high.
Weight: 7½ lbs.
Warranty: Limited 90 day.

ORDERING INFORMATION — **SPECIAL INTRODUCTORY PRICES!**

Model VIDEOSCAN 1000-K, Kit (For advanced builders only)	$595.00
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Call sign option (Six letters maximum)	$ 50.00

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Part Two

Ken Rothmuller, WA6NFA
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Color SSTV

PhotoCaster (tm) is a new SSTV system for the APPLE II computer which will be available from COMMSOFT in the near future. It offers black and white as well as color SSTV capabilities. In last month's article the black and white features of the system were described. This month the color modes will be discussed.

By adding the PhotoCaster I/O board and software, you can transform your APPLE II personal computer into a full-featured SSTV system. To create color pictures, PhotoCaster uses the high resolution color graphics features of the APPLE II. PhotoCaster extends the APPLE II capabilities to produce color photographs with additional colors and color intensities. The APPLE II can generate six unique colors (black, white, blue, green, orange/red, and violet) with a resolution of 140 by 192 pixels. PhotoCaster adds two additional colors (yellow and cyan) plus 16 different saturation levels (a mix of white with the color) by dot mixing. In addition, 16 intensity levels are simulated by dot dithering. Dithering is also used to achieve 16 gray levels in the black and white mode.

By combining APPLE HIRES color graphics with PhotoCaster software, color images are formed by the eight combinations of the three primary colors (red, green and blue). Even though the use of 3 frame buffers with direct RGB drive can result in higher quality images, PhotoCaster closely represents the color content of color SSTV pictures at a much lower price.
Two color SSTV formats are available with PhotoCaster: the popular three frame RGB format and a new single frame, 8-second format. Color images can be constructed by first:

1. Capturing three color filtered frames using a standard black and white TV camera, or

2. Using the PhotoCaster editor to build three separate, but related, title/graphics frames, or

3. Receiving three frames over the air.

Three RGB frames are then combined by software to produce a color image which can be displayed on an unmodified TV set (via an RF modulator) or on a color monitor. A valuable benefit of the combining process is an encoded 128 x 128 pixel color buffer which contains all the information necessary to re-display the color frame on any APPLE II. The encoded color images can be manipulated in the same manner as B&W frames. They can be saved and recalled from disk and even transmitted to another PhotoCaster system in 8 seconds!

A number of color features are available in each of the major subsystems within **PhotoCaster:**

FSTV Capture

Color exposure control for remembering variations in color filters.

Color capture which directly copies three RGB frames to disk.

Filter prompting to insure that the correct filter is being used for the proper RGB frame.

Display

A single slide number will access the three color frames in sequence (as they were put there by Capture or Receive) and convert the RGB information to APPLE II color graphics.

Once converted, the encoded color image can be saved as a single frame and later redisplayed.

Receive

The RGB receive mode converts the three frames to color on-the-fly. The user selects the best frame for each primary color.

R, G or B frames can be individually replaced if they were interfered with without affecting the two noise-free frames.

Each RGB frame can be buffered to disk for later transmission or manipulation.

Eight-second encoded color frames can be received and directly displayed.

Transmit

A single photo number will access the three color RGB frames in sequence with a short delay separating each one.

A unique color test bar is present at the top of the frame to allow the receiving station to identify which RGB frame is being sent.

In addition, the Enhancement subsystem will generate color images from B&W frames (pseudo color) for highlighting the different gray levels in a picture. It is also possible to use the Editor to generate color title slides by either preparing three RGB frames individually or by directly generating one encoded color slide. Of course, it is also possible to augment captured or received color images using the Editor.

Color adds a new dimension to SSTV. While it will not obsolete B&W TV because of the additional transmission time, for much program material it can deliver information not possible with a B&W picture. **PhotoCaster** is an easy and inexpensive way for those amateurs with APPLE II computers to get started in color SSTV.

Next issue; IMAGE ENHANCEMENT SSTV HARDCOPY PICTURES for the Apple Computer-WA6NFA

MAJOR COLOR COMPUTER BREAKTHRU BY K6AEP/WB5MRG

A TRS-80C COMPUTER DISPLAY BOARD

by Clay Abrams K6AEP
A5 Magazine Contributing Editor

After the development of the TRS-80C receive SSTV software I knew that improvements must be made. The quality of the pictures were lacking in quality, but they did allow usage of a standalone computer for SSTV applications. In order to enhance picture quality, hardware must be designed. This article describes such hardware. Due to article page restrictions a schematic will not be published, but is available for reproduction costs from Multimode Corp (Ref 6). This card is designed to be used for picture display applications like, Amateur Radio SSTV, Weather satelites, computer graphics and telephone communications. To use these modes it is only necessary to change the front end interface and software. The basic design concept of this board is not new. In articles (Ref 1 & 2) a similiar design was published. Refer to these two articles for a more complete description. A follow on article will be published for a TV camera interface. This interface should be available during 1983.

DESIGN CRITERIA

The card was designed to display black and white SSTV pictures with: 256 pixels, 128 lines & 16 gray levels or 128 pixels, 128 lines & 16 gray levels. Color SSTV with: 128 pixels on 128 lines & 256 colors.

GENERAL OPERATION

The card is intended to be used as a picture display card for the TRS-80C.The card continuously displays a picture which has been placed in the RAM on the card. The picture must be first loaded into the RAM in the TRS-80C. The picture can then be transfered to the card by a simple block move. The card must be powered from an external DC power source other than the computer (plus 5 & 12 volts). A picture will be displayed on the card as long as power is applied. The computer can be powred up and down without affecting the display card. To place the picture into the computer RAM requires some sort of SSTV demodulator. PC boards for the demodulator are available from different sources such as Multimode (ref 6) or Bob Wilson. One such design is described in A5 Magazine (ref 3).

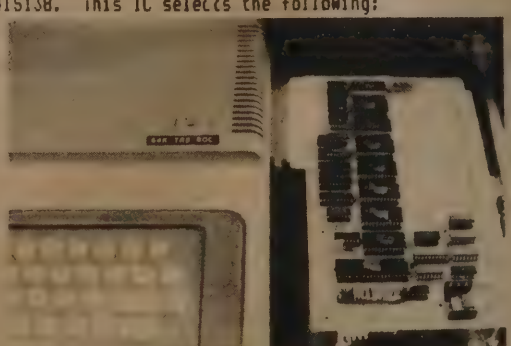
1. SYSTEM INTERFACE

The display board must be attached to the game catridge port on the side of the TRS-80C. This port provides connection to the address, data and control signals of the 6809E MPU. Figure 1 provides a block diagram of this interface. Wiring to the CPU IC must be as short as possible, less than one half inch leads are a must. The data lines are connected to both the eight RAM IC's and the VDG (6845) display controller IC through a data bus tranceiver. To determine if the CPU is reading or writing to the board is controlled by the R-W line. In order for the display controller IC to function you must first write data in its internal 18 registers. Only three address bits of the 6809 CPU IC are connected to the card. These low order address bits select the mode which you are performing. The SCS line on the TRS-80C connector is used to select address FF40. The interface E line is the enable signal from the 6809 CPU. This line is used to synchronize the 6845 to the CPU IC for writing to its internal registers.

2. FUNCTIONAL SELECTION

All internal functions of the card are software selected by a 74LS138. This IC selects the following:

ADDRESS	SIGNAL
FF40	V60 VDG Controller address register
FF41	V61 VDG Controller data register
FF42	B-W SSTV from the card
FF43	Color SSTV from the card
FF44	Reset - Reset RAM address counter
FF45	Select - Send picture data to card
FF46	Frame Grab - Place SSTV picture in video RAM.
FF47	Color - Advance RGB color on frame grab



PROTOTYPE TRS80C HIGH RESOLUTION SSTV BOARD

3. RANDOM ACCESS MEMORY

This card contains 16K of display RAM in eight 2K by 8 bit IC's. Static RAM was used due to construction simplisity and ease of getting the board to function. Dynamic RAM has the advantage of lower cost but requires extra circuitry to develope RAS and CAS signals, and is difficult to correct and diagnose problems when they occur.

4. VIDEO DISPLAY GENERATOR

The VDG is the heart of the display board. This integrated circuit has 18 registers. In order to make the board operational the registers must be pre-loaded before a picture can be displayed on the card. This IC is used to develope the video refresh timings of the RAM. By simply changing the initilization values either 50 HZ or 60 HZ video can be displayed.

5. THE MASTER CLOCK

The master clock is a crystal oscillator operating at 6.144 MHZ, and is generated by two 74LS00 IC's. This crystal frequency was chosen to display an active picture time of 42 microseconds. The initilization software of the 6845 is used to fine tune this display time. A counter is used to divide the clock frequency by 2 and 4.

6. THE INTERNAL DATA AND ADDRESS BUS

The entire card is designed to display a SSTV picture continuously. Since the card must be powered by an external source different from the computer, power can be dropped on the computer and the display will still be active.

When a picture is to be displayed on the card, the refesh process is interrupted for a few micro seconds. This causes a small white line to appear on the display. The direct memory access (DMA) scheme used on the card is very simple in principal. Normaly the addressing of RAM is from the VDG through two tri-state buffers. When the CPU writes to RAM, not ram select is brought low and the RAM address is generated by two counters. At this time the VDG buffers are floated on the address bus and the counter buffers drive the bus. After the RAM has been written, the counter advanced to the next address.

7. DISPLAY DATA

The digital display data is latched from the data bus at the correct time by the 74LS374 the black and white is twice the rate as color. The 74LS374 is latched from the data bus every 650 nano seconds. This data is fed to both the black-white and color modulators. A multiplexer is used to feed the black and white modulators. The multiplexer 74LS157 is clocked at a rate of 325 nano-seconds which is 256 pixels per line of SSTV.

8. BLACK AND WHITE MODULATOR

The black and white modulator is fed from the multiplexer which feeds first the low order 4 bits (nibble) then the high order nibble. The output of the multiplexer is connected to a simple digital to analog converter (D-A) which consists of a transistor and 10 resistors. Sync pulses generated by the VDG are fed into the modulator to create composite video.

9. COLOR SSTV MODULATOR

The color SSTV modulator consists of three IC's LM1889, LM1886, and a 9602. The SSTV modulator functions by clocking the picture data on the latch. The data is next transfered to the LM1886 which converts the digital to difference and luminance signals. These signals are intern connected to the color modulator which provides composite color video. Three additional signals are provided to the LM1886 which are blanking, sync pulse and a burst gate. The burst gate is deleloped from a 9602 which is a dual single shot. The burst gate serves as a reference signal for color monitors. The location of the burst gate must be adjusted to the correct position on the horizontal blanking back porch. This is the only adjustment on the board.

10. PROGRAMMING CONSIDERATIONS

To display a picture on the card a digitized picture must be loaded into RAM. The black and white picture format consists of 2 pixels per byte. The low order pixel is the upper 4 bits the high order pixel is the lower 4 bits. To store the picture on the card the following procedure is used:

A. First reset the card counter by storing the accumulator at address FF44.

B. Load a picture byte into a accumulator and store it at address FF45.

C. Repeat step B for 16K bytes and a SSTV picture will be displayed on the card.

To display a color picture the process is a little more complex. Three 8K RAM locations must be first loaded with red, green, and blue picture information. The composite picture is created by mixing three bits of Red in the lower three bits of a byte. Then three bits of a green picture is mixed in the next three bits. Lastly two bits of the blue frame is mixed into the upper bits of the byte. To display the composite picture the mixed bytes are transfered to the card. The composite video from the card is attached to a RF modulator, then connected to a TV set.

11. PROTOTYPE CARD

Attached are photo's of the K6AEP prototype card. The card was constructed on a SS50 prototype card from Percom (Ref 4). A small buffer interface card (Ref 5) was obtained from a firm in Canada. This card allows the computer to be isolated from the display card. This buffer interface has very short wiring from the 6809E to the interface IC's. The pictured prototype card does not have the color modulator (3 IC's) installed. All wiring was point to point soldered on the reverse side of the card. Construction of such a prototype card is not an easy task, and should not be attempted by a person without extensive electronics construction experience.

A complete schematic and documentation package of the card can be obtained from Multimode Corp (Ref 6) for $3.00. The Multimode design will be slightly different from my prototype board. PC boards will be available from Multimode during the last part of 1982.

CONCLUSIONS

Pictures displayed by the card are quite acceptable by any standard. Comparisons were made of Black and White pictures on a Robot 400. The TRS-80C had better resolution than the Robot 400. Two pictures are included of a SSTV picture displayed. The pictures were placed on tape by George WB9LVI with 64 gray levels and displayed with 16 gray levels. I must say my photography is not the greatest they looked much better on the TV set. The color SSTV picture quality was a pleasent suprise. Comparisons were made between two popular "Three memory" Robot 400 modifications with the following observations.

1. Color SSTV pictures like clowns, birds, flags produce pictures with equilivant results. The TRS-80C pictures produce more vivid, brighter colors. This type of pictures are the type most frequently transmitted on the low frequency bands.

2. Color SSTV pictures like human faces and large areas of blue sky were degraded on the TRS-80C. The facial tones showed pronounced contouring. This effect was not considered desirable but did not significiently distract from the picture quality. The three memory Robot pictures were smoother with less contouring but looked washed out in comparison to the TRS-80C.

For information on software availability please contact me by mail, please include a SASE.

A project of this size takes a considerable effort and could not be accomplished without the help of others. Some of the people involved in the project were: Bob Blackstock (WB5MRG) who constructed the first card prototype, and corrected all my hardware design errors. Ron Adair (K5HFT) for producing the PC board and cleaning up my messy documantation. George (WB9LVI) for providing the SSTV pictures of superior quality, and Syd (VE3EGO) for taking the time to perform experiments on color SSTV picture quality.

REFERENCES

1. Display SSTV Pictures on A Fast Scan TV, by: Clayton W. Abrams, Ham Radio Magazine, July 1979

2. Microprocessor Applications Handbook, Edited by Robert Stout, Chapter 15, A Microprocessor Based SSTV System, by: Clayton W. Abrams, Mc Graw Hill 1981

3. An Amateur Radio SSTV Computer Interface, by: Dave Sargent, A5 Magazine, September 1982

4. Percom Data Systems,211 N. Kirby, Garland, Texas,75042

5. Northern Neighbors, Ted Baleshta, 42 Herrington Court, Nepean, Ontario, Canada K2H 5N7.

6. Multimode Corp, 4005 Rockhill Court, Arlington, Texas, 76016

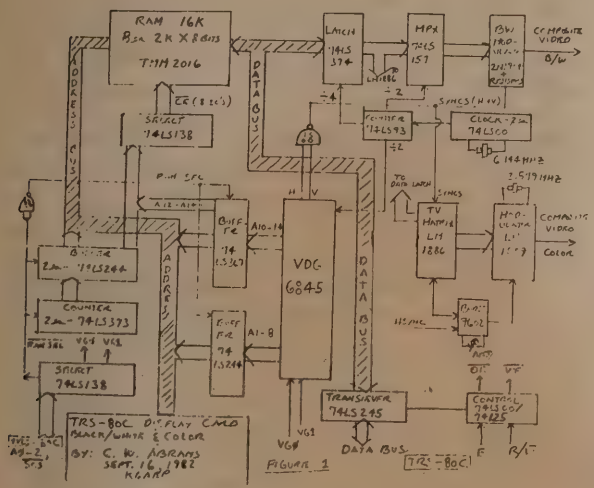


FIGURE 1

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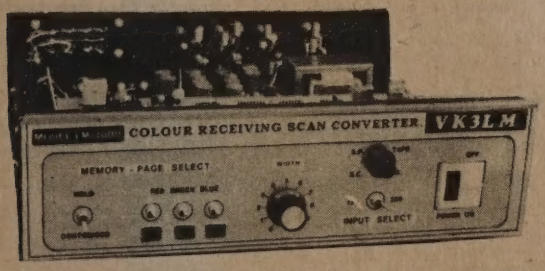
"SHARP" COLOR SSTV RGB FILTER SNATCH METHOD DEVELOPED

Sometimes, some of the most innovative thinking and unique methods surface by Radio Amateurs while trying to make mode operation as simple as possible. Such is the case by an Ohio Color SSTV'er Fred Sharp W8ASF (pictured on the A5 October 82 issue). Fred loves SSTV, and has been in from the beginning as Color experimentations on popular SSTV frequencies flourished in 1980. The tedious holding the RGB filters in front of a black and white camera just didn't excite Fred very much, and given time-he personally devised a "SHARP" method of automated frame rotation and snatch entry in the Robot 400 SSTV Converter. He writes to "A5" that 3" X 3" filters are used (25 Red, 58 Green, and 47 Blue) that are plastic welded into a turntable. A "Skan-A-Matic" Microskan, retro-reflective scanner unit is used (available thru W8ASF) in which the motor (12 rpm) scans looking for reflective tape and when found trips a normally closed reed relay switch (found at Radio Shack stores). Full details of this system are available from Fred (SASE) and the snatching into memory takes lass than 3 seconds! For those of you who have a "jungle" of wires, switches and jumper cables in the "shack" (which means just about all of us), you also might be interested in W8ASF's small concise switching control center (block diagram available) which ties in his Robot 400 Converter, 800 keyboard, audio tape deck, HF and VHF equipment, black and white monitors and color TV sets, michrophones and even RTTY gear! It's all packed in a small box enclosure utilizing pushbutton switching for easy operator command control (photo on October A5 issue just above 800 keyboard to the right of Robot 400). We found that publishment of Fred's neat little system would require to many pages to cover with detailed drawings that are a crime to try to reduce at our printers to save space. So, drop Fred a line and get all the details directly. W8ASF, PO Box 22277, 23715 Mercantile Road, Cleveland, OH-44122



1982 BECOMES
THE YEAR FOR NEW SSTV SYSTEMS!

John Wilson VK3LM and David Cowie ZL1LH have teamed up and created a new Australian SSTV Converter "LM-3000". Based on the JAØBZC A5 Magazine article (#9-2 & 10-2), it incorporates many features found on similar USA SSTV products for today's television mode Amateur. An elaborate full-featured "LM-8000C" model includes 3-memories based on the KD6HF design modifications from the Robot 400's for full color SSTV transmit and receive! Optional 256 resolution is available as well as circuit boards for advanced builders. Write VK3LM or ZL1LH for details (send SASE!).

NEW TV MODE HAS 525 LINE "LIVE" RESOLUTION!

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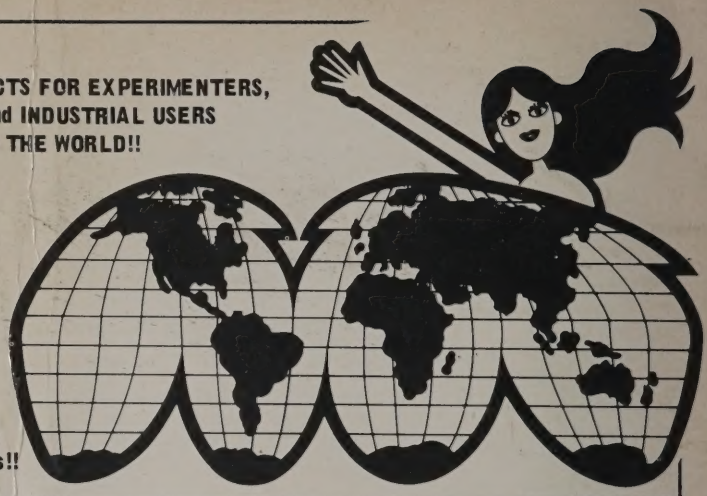

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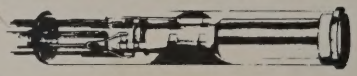

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